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(Complete Index on Page VIII)

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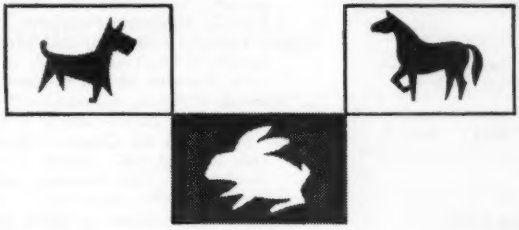

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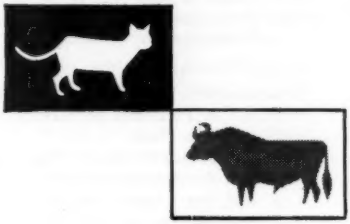

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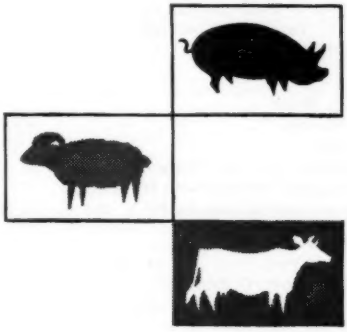

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Hormonal Hypothesis Of Prepartum And Postpartum Acetonemia In Dairy Cattle

GUILLERMO PUNTRIANO, D.V.M., M.S., Ithaca, New York

PART III*

Suggested Hormonal Treatments for Acetonemia in Lactating Cows

THE practitioner is aware that no one definite treatment cures all cases of acetonemia. Furthermore, some cases of acetonemia recuperate without treatment, while others progress dangerously in spite of several kinds of treatment. The well known therapy of intravenous injection of dextrose is satisfactory in many cases, but ineffective in others.

The answer could be given by explaining that not all cases of ketosis have the same etiology. The hypoglycemic condition, which is a common disturbance present during ketosis, could have its main origin in a hormonal imbalance, in accordance with our hypothesis, or from functional disturbances either of the pancreas, liver, kidneys, or from nutritional factors.

In the present paper, discussion is limited to the hormonal factors in the development of acetonemia, which in the writer's viewpoint are the most frequent. The prevalent role in ketosis assigned to a hormonal imbalance originating from ovarian or adrenocortical dysfunctions, seems to be in accord with the frequency with which these endocrine glands are exposed to inexpert palpatory diagnosis, or injuries from stress conditions. The suggested hormonal treatments for ketosis would be directed mainly to release the hypoglycemic condition since this procedure would normalize the excess ketone body production. For that purpose it would be advisable to prescribe a hormonal treatment capable of decreasing the demands of carbohydrates (to correct a secondary cortical insufficiency) and to increase the sources of blood sugar (to correct a primary cortical insufficiency). In other words, it would be recommendable to use hormones which will:

(a) Decrease the milk secretion,

(b) Stimulate the hormonal output of the adrenal cortex,

(c) Stimulate the appetite and the glucogenesis function of the liver directly.

To fill these purposes, the separate or combined use of gonadotropic hormones, estrogens, ACTH, and adrenal extracts (or cortisone and desoxycorticosterone) is suggested in accordance with the etiology of acetonemia.

The Use of Gonadotropic Hormones (PMS) in Acetonemia

The use of these hormones would be recommended in acetonemic cases resulting from a hypo-ovarian follicular secretion. The administration of gonadotropic hormone (pregnant mares' serum, PMS) would stimulate the ovarian follicular secretion and thus would restore the level of estrogens to the physiological threshold ratio existent for lactation. As a result of this, both the corticomimetic and lactogenic effects of the estrogens would be corrected and ketosis would disappear.

The following treatment could be investigated:

PMS (gonadogen,® The Upjohn Co.)—80-100 Cartland Nelson units by intramuscular injection.

Repeat treatment after 48 hours.

The excessive or prolonged administration of gonadogen could stop the lactation. Further, it would favor ovulation** since the product contains large amounts of FSH and LH. In view of the latter possibility, the gonadotropic treatment could be more beneficial in those acetonemic cows with low fertility records or irregular estrus cycles.

The Use of Estrogens in Acetonemia

The use of estrogens would be advisable in acetonemic cases resulting from an increased lactation due to genetic factors and suckling or milking.

The administration of estrogens will decrease the milk secretion due to its inhibitory effects upon the release of prolactin from the anterior pituitary gland. Furthermore, estrogens would increase the output of ACTH from

*Part II appeared in VETERINARY MEDICINE, August 1951, p. 301.

the anteropituitary, due to its corticomimetic effects. In this form, the hypoglycemic condition would be corrected.

The use of estrogens could be accompanied with an intravenous administration of water and normal saline solution (NaCl) to obtain prompt results; since in acetonemia, in accordance with our hypothesis, an insufficiency of mineralocorticoids is thought to exist.

The following treatment could be investigated:

Stilbestrol (diethylstilbestrol)—25 mg. during first day; 20 mg. during second day; 15 mg. during third day.

Normal saline solution—500 cc. intravenously per day.

Ascorbic acid (vitamin C)—6 gm. (120,000 U.S.P. units of vitamin C) intravenously per day.

It would be helpful to include in the above treatment a certain dosage of thyroxin, since this hormone has been shown to augment the corticomimetic effect of stilbestrol. (The administration of ascorbic acid is for the purpose of facilitating the building up of corticosteroid hormones of the adrenal cortex).

Excessive or prolonged administration of stilbestrol would cause ovarian atrophy; since this hormone will inhibit the output of FSH by the anteropituitary. In this latter case, a recurrence of the acetonemic condition would be noted (after a temporary improvement) when the administration of stilbestrol is suspended.

The Use of ACTH in Acetonemia

The use of ACTH could be helpful in those acetonemic cases resulting from exhaustion of the adrenal cortex which has been extensively treated with adrenal extracts. The latter hormones would give opportunity to the adrenal cortex to recuperate from the exhaustion and then become functionally regulated when the administration of ACTH is initiated.

The ACTH would be helpful also in those acetonemic cases resulting from hypo-ovarian follicular secretion, when it is added to the main treatment with PMS. This latter hormone would increase the estrogenic ovarian output while ACTH would correct promptly the primary cortical insufficiency.

Finally the use of ACTH in acetonemia would be recommended in cases resulting from an increased milk secretion due to genetic factors.

The ACTH treatment will stimulate the adrenal cortex to increase its output of cortical steroid hormones, of which the glucocorticoid group will, in turn, stimulate the glucogenesis function of the liver. This latter function would supply increased amounts of sugar to the blood. The hypoglycemia would thus be overcome. In other words, the ACTH would correct a primary cortical insufficiency in acetonemia. This treatment would not decrease the milk secretion but would favor an increased lactation. That is why it would be advisable to reduce or suspend the milkings (to correct the secondary cortical insufficiency which usually complicates these cases), during the treatment of those acetonemic cases resulting from genetic factors and suckling or milking. The use of ACTH could be accompanied with the administration of normal saline solution plus vitamin C to obtain more prompt results.

The following treatment could be investigated:

ACTH — 150-200 mg. intramuscularly (doses which could be repeated after 48 hours).

Saline solution—500 cc. per day (intravenously).

Ascorbic acid—6 gm. per day (120,000 U.S.P. units of vitamin C) intravenously.

In advanced cases of acetonemia, it would be helpful to add to this treatment 500 cc. of 40% dextrose solution intravenously.

The dosage of ACTH is an important factor in the treatment of acetonemia in cows. Excessive doses of ACTH or a prolonged treatment with that hormone would cause an increased output of cortical steroid hormones from a normal adrenal cortex, which in turn would inhibit the output of ACTH from the anteropituitary of the cow. A decreased production of ACTH would predispose to an increased synthesis of prolactin from the acidophil cells, according to the previous hypothesis. Consequently, when the excessive or prolonged treatment with ACTH is suspended, there may be a recurrence of acetonemia.

The Use of Corticoadrenal Extracts, or Cortisone and Desoxycorticosterone in Acetonemia

The use of these hormones would be suggested in cases of ketosis when the etiology is supposed to be an exhaustion of the adrenal cortex.

Two methods of approach may be used in treating acetonemic cows suffering from exhaustion of the adrenal cortices: (a) reduce or suppress the stress condition (lactation, cold, diseases, inadequate diet, etc.), and (b)

administer the necessary hormonal dosage of corticoadrenal extracts (or cortisone and desoxycorticosterone).

First Requirements. In order to reduce the lactation, use stilbestrol in a dose of 10 to 15 mg. during two or three days, or simply reduce the frequency of milking. (Repeat milkings during gestation are contraindicated since it exposes the animal to adrenocortical exhaustion). It should be noted in many cases, that a cow that decreases the lactation by herself, shows improvement in the acetonemic condition without any treatment.

Acetonemia cases complicated with pneumonia, metritis, etc., should be treated primarily for these diseases.

Finally, in any case of ketosis, the oral administration of sugar or molasses is contraindicated, since carbohydrates are converted to lower fatty acids by the bacterial flora of the rumen; these lower fatty acids, after being absorbed from the rumen, are converted to ketone bodies in the liver.

Secondary Requirements. The administration of corticoadrenal extracts would stimulate the gluconeogenesis function of the liver and the appetite in an acetonemic cow suffering from a primary cortical insufficiency. As a result of these stimulations, the hypoglycemic condition first, the ketosis second, would be corrected.

The administration of adrenocortical extracts in a cow suffering from ketosis would allow her to continue lactating in amounts which would depend upon the dosage of hormones administered. The hormonal dosage is an important factor in this kind of disturbance. The administration of a correct dose of extract (as well as cortisone and desoxycorticosterone) would depend upon the degree of exhaustion of the adrenal cortex of the acetonemic cow and upon the interval since the disorder appeared.

In respect to the degree of exhaustion of the adrenal cortices in an acetonemic cow, it should be termed as a benign, relative, or atrophic exhaustion. These degrees could be progressively represented in the same cow in accordance with the duration and severity of the ketosis. The hormonal dosage in this kind of ketosis, therefore, would be related to the degree of adrenocortical exhaustion.

The use of cortisone (compound E of Kendall) in acetonemia would be especially recommended by the writer, since that hormone is one of the most active in the glucocorticoid group to stimulate the gluconeogenesis function of the liver. (It has been pointed out before that a cow normally maintains its blood glucose level largely through gluconeogenesis). Cortisone causes an increased utilization of amino acids followed by sparing of carbohydrate and fat, thereby favoring their storage, according to Stoerk and Porter[9]. The concept that the primary action of cortisone and related compounds is to stimulate gluconeogenesis from proteins does not fully explain the extent of glycosuria or the insulin resistance that can be induced by these compounds[87]. In regard to the latter point, Ingle's opinion[88] is that "it seems necessary to assume that these hormones (cortisone) either stimulate gluconeogenesis from fat or that they inhibit some phase of carbohydrate utilization (oxidation, storage as glycogen or conversion to fat)".

The following treatment with cortisone for each separate case, could be investigated:

1. Early cases of acetonemia from adrenocortical exhaustion. (Cows which could be treated as suffering from a benign adrenocortical exhaustion.)

   Cortone® (cortisone acetate, Merck & Co.)—500-1,000 mg. intramuscularly (around 1 mg. per pound of living weight), one dose.

The above treatment during early cases of acetonemia caused by benign adrenocortical exhaustion, would be highly beneficial, since the administration of this hormone to the organism would give opportunity for the adrenal cortex to recuperate from the exhaustion and become sensitive to the regular stimulus of ACTH from the anteropituitary gland.

2. Progressive cases of acetonemia from adrenocortical exhaustion (Cows which could be treated as suffering from a relative adrenocortical exhaustion.)

   Cortone® (cortisone acetate, Merck & Co.)—500-1,000 mg. intramuscularly.

   Desoxycorticosterone acetate (DOCA)—20 mg. intramuscularly. Repeat the above treatment after 72 hours, using half of the dose, if it is necessary.

3. Advanced cases of acetonemia from adrenocortical exhaustion (Cows which could be treated as suffering from atrophic adrenocortical exhaustion.)

   Cortone® (cortisone acetate, Merck & Co.)—1,000-1,400 mg. intramuscularly.

   Desoxycorticosterone acetate (DOCA)—20 mg. intramuscularly.

   Dextrose solution 40%—500 cc. intravenously.

   Normal saline solution—500 cc. intravenously.

Repeat the above treatment using cortisone and desoxycorticosterone in half of the dose, after 72 hours.

The treatment with adrenocortical extracts, such as the lipoadrenal cortex® (Upjohn Co.) which is an extract containing the more active hormones of the mineralo- and glucocorticoid groups, also could be recommended for research purposes, in the treatment of ketosis from adrenocortical exhaustions.

The treatment with cortisone, as well as adrenocortical extracts, is perhaps the most beneficial and least dangerous of the hormonal treatments of acetonemia. In fact, since these hormones are recommended for cases of adrenocortical exhaustions, the hormonal interplay at time of its administration would be interpreted as follows: Due to the low hormonal output of the adrenal cortex, the anteropituitary increases its output of ACTH. This latter hormone would have little effect on an exhausted adrenal cortex. The administration of cortisone (aided by an artificial reduction of lactation) would give opportunity to the adrenal cortex to recuperate from its exhaustion and become sensitive to the regulatory stimulus of the ACTH from the anterior pituitary gland. Furthermore, cortisone acting on the anteropituitary, would decrease and thus regulate, the output of ACTH, since the output of this latter hormone is usually increased during adrenocortical exhaustion.

CHART 1. Hormonal Hypothesis of Postpartum Acetonemia in Dairy Cows

1. OVARIAN DYSFUNCTIONS				HORMONAL TREATMENT RECOMMENDED
Hyperovarian follicular secretion (nymphomaniac cows) (estrogens in concentration above the "physiological threshold ratio" prevailing during lactation)	→ Anteropituitary	Decreases its release of prolactin Increases its output of ACTH ("corticomimetic" effect of estrogens)	Improbable development of acetonemia	
Hypo-ovarian follicular secretion (estrogens in concentration below the "physiological threshold ratio" prevailing during lactation)	→ Anteropituitary	Permits the release of prolactin in larger quantities. Output of ACTH in insufficient amounts to attend the lactation (decreased "corticomimetic" effect of estrogens)	Acetonemia would develop as a result of a "primary" and "secondary" adrenocortical insufficiency	PMS or PMS+ACTH
2. EXHAUSTION OF THE ADRENAL CORTEX				
Lack of a normal response to stimulus (inadequate output of cortical steroids to maintain lactation, as result of adrenocortical failure to respond normally to the "alarm reaction" and "corticomimetic" mechanisms)	→ Anteropituitary	Increases its output of ACTH (with little effect on an exhausted adrenal cortex) ↓ (Probably decreases the synthesis of prolactin by acidophils)	Acetonemia would develop as a result of a "primary" adrenocortical insufficiency	Cortisone+DOCA or adrenocortical extracts
3. GENETIC FACTORS				
Great functional development of the mammary gland: excessive lactation (probably also, factors associated with increased stimulus from suckling or milking)	→ Anteropituitary	Increases its output of prolactin (to attend increased demands from the mammary gland) ↓ (Probably decreases the synthesis of ACTH by the acidophil cells)	Acetonemia would develop as a result of a "secondary" and probably a "primary" adrenocortical insuffiency	ACTH+decreased milking or stilbestrol

Practical Method of Diagnosing the Etiological Endocrine Gland Involved in Cases of Acetonemia

The practitioner could arrive at an approximate diagnosis of the etiologic type of endocrine gland involved in acetonemia by identifying the particular case by means of the following groups of questions:

(a) Had the cow a record of low fertility previous to her last pregnancy? Is she considered a "hard breeding" cow?

(b) Had the cow irregular estrus cycles previous to her last pregnancy?

(c) Did the cow start increasing her average milk secretion previous to the attack of ketosis?

Affirmative answers to some of these questions would indicate a probable hypo-ovarian follicular secretion.

(a) Did the cow have twins or an extremely large fetus?

(b) Did the cow suffer from dystocia or was cesarean section performed?

(c) Did the cow suffer from any diseases during pregnancy or did the last three months of pregnancy occur during the winter?

Affirmative answers to some of these questions would indicate a probable adrenocortical exhaustion. This diagnosis could be supported by additional information such as: For how long before parturition was the maximum milk yield of the cow maintained and which parturition was this last one (first, second, third, etc.)?

(a) Is the cow of genetically high selection and high milk secretion with a history of regular estrus cycles previous to the last pregnancy?

(b) Has the cow a history of acetonemic attacks at each postpartum period?

(c) Did the cow descend from a herd with a history of frequent acetonemic attacks?

Affirmative answers to some of these questions would indicate a probable genetic factor as etiology of the particular acetonemic case.

Suggested Approaches to Investigate the Postulated Hormonal Hypothesis of Acetonemia in Dairy Cattle

A series of experiments would be proposed to approach the investigation of our hypothesis which postulates that ketosis is mainly caused from a primary or secondary insufficiency of cortical steroids.

1. Biological assay of glucocorticoids in cows.

The purposes and methods are: (a) To find the average rate of urinary excretion of glucocorticoid hormones in a normal lactating cow as an index for measuring its adrenocortical function in the metabolism of carbohydrates. Determine the rate for an average milk producing cow, and the rate for a high milk producing cow. Factors such as breed and age should also be considered. For that purpose, the Venning's method[29] for the biological assay of urinary glucocorticoids is recommended.

(b) Repeat the above determination in a lactating cow suffering from acetonemia. The difference in rate of urinary excretion of glucocorticoids between a normal lactating cow and an acetonemic cow during lactation (provided that both cows are same breed, approximate age and type of milk producer) would give us an indication of a possible adrenocortical insufficiency.

2. Clinical data obtained from the response to the suggested hormonal treatment for acetonemia.

The clinical response from the proposed hormonal treatments would give important data, the interpretation of which would indicate, indirectly, a possible adrenal cortex involvement in acetonemia.

The same cow would serve as control and as experimental subject if the clinical data is analyzed, before and after the administration of the treatment.

Investigation, before and after the treatments with ACTH, PMS, cortisone, or diethylstilbestrol, of the level of: (a) urinary glucocorticoids; (b) blood glucose; (c) ketone bodies in the blood and urine; (d) Na, Cl, K, and Ca ions in the blood; (e) N.P.N.; (f) eosinophils (especially during the treatment with ACTH), lymphocytes (especially during the treatment with cortisone) and neutrophils in the white blood cell count.

3. Histopathological data.

The histopathological information from ovaries, adrenal gland, thyroids, and pituitary from a cow which died from acetonemia and which was refractive to hormonal treatment, would give important data for the determination of the etiology of ketosis.

For research purposes, it would be advisable to perform a unilateral adrenalectomy in a cow suffering from persistent acetonemia. The histopathological picture of the adrenal cortex could give valuable information in the etiology of that case. Further, the determination of ascorbic acid and cholesterol contents of that adrenal cortex, would give an indication of its functional state.

A bilateral adrenalectomy in a cow in order to produce experimental ketosis, could also be suggested. To restore normality by the admin-

istration of adrenocortical extracts would give an idea of the necessary dosage of glucocorticoids and mineralocorticoids needed by a normal cow and also for the treatment of a clinical case suffering from acetonemia.

4. Stress conditions and unfavorable environments.

It would be useful to determine to what extent the incidence of an increased stimulus, such as repeated milking during gestation or excessive milking during lactation, poor diet associated with low temperatures during lactation, and fasting condition, would account for the development of acetonemia in dairy cows.

Summary

It is postulated that the insufficiency of cortical steroids is a causative factor in the development of acetonemia in dairy cows. The cortical insufficiency is thought to be due either singly or to a combination of, hypoovarian follicular secretion, exhaustion of the adrenal cortex, abnormal function of the anterior pituitary gland or genetic factors. The latter factors, when associated with the great development of the mammary gland, would produce acetonemia directly, as the result of a secondary cortical insufficiency, or indirectly, as the result of a primary cortical insufficiency.

When the genetic factors are linked to a hereditary abnormal physiological potentiality of one or many members of the endocrine system, the development of ketosis would occur when a stress condition, such as lactation, converges the abnormal hormonal interplay in a cortical insufficiency.

A hormonal treatment for acetonemia and an approach to investigate the postulated hormonal hypothesis of ketosis are suggested.

Chart 1 summarizes the etiological possibilities of the predisposing factors in the development of acetonemia in dairy cows.

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Diethylstilbestrol or similar estrogenic hormones are not permitted to be used for hormonizing poultry in Canada.

Oxygen Therapy In Surgical and Medical Procedures In Small Animals

A. T. KNOWLES, D.V.S., JACK O. KNOWLES, V.M.D., and ROBERT P. KNOWLES, D.V.M., Miami, Florida

IN a recent communication,[1] the authors described the technic and equipment for administration of oxygen to dogs during surgical and medical procedures. They called attention to the inability of many veterinarians to perform thoracic surgery because of lack of suitable equipment to maintain respiration and adequate oxygenation of the animals during such procedures. They described an endotracheal apparatus and a small oxygen hood, originally designed for human use, which were later adapted for animal use.

Further experimentation and experience have indicated that equipment, specifically designed for animal use, was necessary to perfect the technic described earlier[1].

Oxygen Administration Necessary in Thoracic Surgery

The dangers involved in the opening of the pleural space, either by injuries or surgery, were recognized by the ancient Greeks. In the 16th century, the anatomist, Vesalius, demonstrated the hazards of pneumothorax and also described crude methods to prevent or overcome these hazards.

It has been only in the last 40 years that satisfactory procedures have been developed for maintaining respiration and adequate oxygenation during thoracic surgery.

Many investigators[2,3,4,5,6,7,8] have discussed the problems involved. The consensus may be summed up as follows: (a) that a slight positive pressure is desirable; (b) that intermittent pressure to aid ventilation is sometimes desirable and necessary; and (c) that high intrapulmonary pressures should be avoided. The slight positive pressure maintains the lung in an inflated condition even where marked pneumothorax is involved. When the thoracic wall is opened wide and there is free communication between the pleural space and the outside air, the movement of the diaphragm and the ribs will not adequately inflate and deflate the lung. In such a condition the use of intermittent pressure (3 to 15 cm. H_2O) will assure adequate ventilation with consequent elimination of anoxemia and excessive build-up of carbon dioxide. The use of higher pressures, whether continuous or intermittent, must be avoided because of the possibility of overinflation of the lung, emphysema, rupture of alveolar membranes and retardation of return of blood to the right heart.

Meltzer and Auer[9] have described a technic whereby a stream of oxygen introduced within the lung by means of a deep seated catheter, will maintain the life of an animal for long periods, even though all respiratory movement has ceased.

Recently Draper and Whitehead[10] and Roth, Whitehead and Draper[11] reported, "that dogs held in respiratory arrest by continuous injection of pentothal sodium continued to maintain life for periods of an hour or more, provided that; (a) the nitrogen of the atmosphere and respiratory tract had been largely replaced by oxygen at the time breathing had ceased; (b) the circulation remained adequate; and (c) the airway patent." They attributed the maintenance of adequate alveolar oxygen to inward "suction" of the atmospheric oxygen by the "hemoglobin-oxygen pump." They pointed out that the blood entering the lung had a lowered oxygen tension and that if the lung contained only oxygen and carbon dioxide, diffusion of oxygen from the lung to the blood would not lower the alveolar oxygen tension to a dangerously low level. The alveolar CO_2 levels in the animals rose to exceedingly high levels, however, and this factor may explain the relatively high mortality figures of their experimental subjects.

In this communication, a technic is described combining the suggestion and precautions described earlier[2,3,4,5,6,7,8] with those of Meltzer and Auer[9] and Draper and Whitehead[10].

Oxygen Apparatus for Surgery

The endotracheal oxygen apparatus (fig. 1), designed and developed with the aid of the Professional Oxygen Service and the Research and Development Department of Respiration

Aids, Inc.,* consists of an oxygen regulator which is connected by rubber tubing to a nylon inspiratory valve. A rubber bag attached to the lower end of the nylon valve acts as an oxygen reservoir. Leading from the upper end of the valve is a metal "T", one arm of which connects to the endotracheal catheter. The second arm is connected to a pressure bottle by means of a wide bore tube. The pressure bottle consists of a glass jar one-half full of water, in which is immersed a plastic tube marked off in centimeters. The pressure is controlled by immersing the tube to a depth of 1 to 6 cm. The plastic tube is held in place on the jar by means of a perforated rubber stopper. Should a transient elevation in pressure be desired, as in the case of utilizing intermittent pressure for inflating and deflating the lung, it may be achieved by placing a finger over the open perforation of the stopper.

The Animal Chamber for Administration of Oxygen

The second piece of equipment used postoperatively is the animal chamber, (fig. 2). This piece of equipment was likewise designed with the aid of Respiration Aids, Inc.*

The chamber is constructed of aluminum angle with the bottom, one side and one end of waterproof masonite. The top and remaining side is fabricated of clear lucite so that the animal can be seen easily from above or from the side. The access door is constructed of aluminum as are the cooling chamber and struts. The dimensions of the chamber are 40 in. long by 30 in. wide by 30 in. high. Circulation is accomplished by means of an efficient, precision made injector which is capable of circulating 20 cu. ft. of gas per minute through the cooling chamber. The temperature within the chamber can be accurately controlled and a temperature drop of as much as 18 F. below room temperature can be achieved if desired.

The oxygen is introduced into the chamber by means of a pressure regulator. Small oxygen control ports located at the end and door of the chamber can be opened to vary the oxygen concentrations from 50% to 100%. The cooling chamber carries sufficient ice to last six hours.

The animal chamber (fig. 2) has many advantages over the previously described tent. It is much more durable, provides for a higher oxygen concentration, and even a large sized animal can be placed entirely within the chamber; eliminating the need for restraint. The tent permits simple and efficient prolonged administration of oxygen.

Through the use of this animal chamber, it is actually possible to maintain oxygen concentrations above those required for human therapy. There are no motors nor other moving parts, the initial cost is much less, and there are decidedly lower maintenance costs than with a comparable refrigerated human tent.

Hours of Service from Oxygen Cylinders

Reading on flow indicator in liters per minute	Hours of service 244 cu. ft. 2,200 lb. press. 6,900 liters
2	57½
3	38¼
4	28¾
5	23
6	19
7	16¼
8	14¼
9	12¾
10	11½
12	9½
15	7½

To compute the approximate time partially empty cylinders will last; multiply the pounds of pressure by three. This gives the approximate number of liters left in the tank. Divide the liter per minute flow into the total number of liters. Divide this figure by 60; this will give the approximate number of hours the remaining oxygen in the tank will last.

Oxygen Concentrations Obtainable by Various Rates of Flow in the Chamber:

Start rate of flow at 60 lb. for 10 min.
1st 10 min.—Rise in concentration is 3% per min. up to 50% O_2
2nd 10 min.—Rise in concentration is 2% per min. up to 70% O_2
After 40 min.—Concentration is 90 to 100% O_2
Maintain flow at 60 lb.—6 liters per minute (1.p.m.) or 20 cu. ft. of O_2 per min.

Possible Combinations:

1. All ports closed—conc. 95% O_2
2. One head, one foot port closed—conc. 85% O_2
3. One head, two foot ports opened—conc. 65% O_2

*Respiration Aids, Inc., 220 East 2nd St., New York 9, N. Y., builds this equipment which is distributed by Professional Oxygen & Equipment Service, 819 S.W. 12th Ave., Miami, Fla.

4. All four ports opened—conc. 50-55% O_2 CO_2 minimum—1% at 60 lb. for animals 40 lb. or under. For larger animals, use 80 lb. flow.

Surgical Procedure for Repair of Diaphragmatic Hernia

Anesthesia of the surgeon's choice is administered. A generous area of the skin is prepared on the ventral surface of the lower thorax and upper abdomen, which is extended well down the sides.

A sterile, endotracheal catheter with guide (either a metal female urinary catheter or darning needle may be used as a guide) is lubricated with K-Y jelly and inserted into the trachea for about 2 in. A Gray mouth gag, tongue forceps and Allis forceps applied to the epiglottis, will facilitate insertion.

The rubber cuff attached to the endotracheal catheter is now inflated, using a 20 cc. syringe and 19 gauge needle, until firm back pressure is felt against the barrel of the syringe. The cuff tube is now clamped off with Kelly forceps. The catheter should be pulled gently back and forth; if it slides in the trachea, sufficient pressure has not been obtained. Since respiratory distress is a constant symptom in cases of diaphragmatic hernia, the time interval between the accomplishment of surgical anesthesia and the administration of oxygen should be as short as possible. The oxygen should be administered at a rate which will keep the reservoir bag inflated but not distended. This will be at the rate of from 1 to 4 liters per minute in the average case. The pressure bottle should be set at 2 to 3 cm. of water pressure; the concentration of oxygen at 100%.

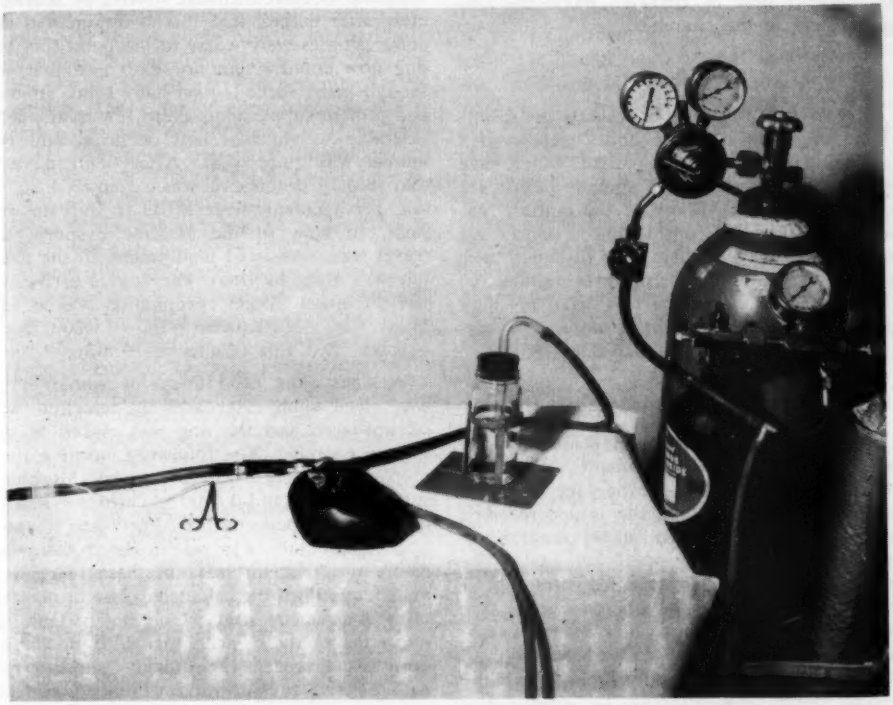

Fig. 1. Apparatus for endotracheal administration of oxygen. The large cylinder equipped with pressure and flow meter is connected by rubber tubing to a nylon inspiratory valve. Rubber bag attached to the lower end of the nylon valve acts as an oxygen reservoir. Leading from the upper end of the valve is a metal "T"; one arm of which connects to the catheter, the other to a pressure bottle.

A transverse abdominal incision is made following the costochondral junction. When the peritoneum is incised, oxygen pressure should be increased slightly. Intermittent pressure increases may be obtained by closing one or more openings in the pressure bottle stopper with the fingers. This is an added safeguard, washing out the CO_2 more efficiently and giving added pressure temporarily. The rate of application of this intermittent pressure should vary from one to ten times per minute, de-

pending on the condition of the patient.

After the diaphragm has been repaired, the patient is maintained on oxygen until an adequate amount is drawn from the reservoir bag. If the patient exhibits any distress after the positive pressure apparatus is disconnected from the endotracheal catheter, place in an oxygen tent with the catheter still in place. This assures a patent airway and a high oxygen atmosphere. As respiration becomes normal, the catheter may be removed while the animal is held in the chamber.

Case Reports

It is difficult to properly evaluate the results of the use of an apparatus and a technic such as the one described. Most patients which have undergone traumatic diaphragmatic hernia are poor surgical risks. Many of the authors' patients have traveled considerable distances for surgery, and some of them have sustained their injuries several months before presentation. All of these factors contribute to a relatively high mortality rate. A few representative case histories are included for illustration.

Recent Traumatic Diaphragmatic Hernia

Case 1. An eight-month-old Dalmatian, the mascot of a local fire department station, was referred by another veterinarian for examination following an automobile injury received two days previously. His diagnosis of diaphragmatic hernia was confirmed by *x*-ray. The animal showed the classical "dog-sitting" position, with abdominal breathing. There were definite "dead spots" upon auscultation of the right lung. Examination of the blood showed the red cell count and hemoglobin within the normal range; and, although the animal was reluctant to move about, it was in generally good spirits. Surgery was agreed upon and the abdominal cavity was opened.

A rent approximately 3 in. long was disclosed in the right diaphragmatic wall; through which a small portion of omentum protruded into the thoracic cavity. A massive area of consolidated hemorrhage was visible in the right lung. The thoracic cage was open for 15 minutes; the entire operation required approximately 45 minutes.

This patient made an uneventful recovery; although dyspnea continued for some weeks, during which time a nonproductive cough developed. Some eight weeks following surgery, the dog appeared normal and examinations some six months and a year later indicated good health with no apparent after effects.

Diaphragmatic Hernia of Long Standing

Case 2. A three-year-old mongrel female was presented some four months following a severe automobile injury. During this interval the animal had been seen by at least two veterinarians who made the diagnosis of diaphragmatic hernia but who lacked facilities to effect repair. Through long distance telephone calls with the owner it was determined that vomiting occurred almost invariably immediately after eating; that this symptom had become progressively worse to the point that the dog now could retain no solids and that, although being force-fed on baby food, vitamin and protein supplements every few hours, considerable weight loss had occurred and the animal was quite weak. After being advised that surgery in this case was extremely hazardous, arrangements were made to ship the patient. In view of the extreme dyspnea, air travel was considered inadvisable, so the journey was made by train. The animal arrived in fair condition. Blood examination was as follows: RBC—4,100,000; WBC—15,200; Hgb.—9 gm.; Sed. rate (Cutler)—25 mm.

A transfusion of 250 cc. of whole blood was given soon after arrival, penicillin was administered and the dog was placed in the oxygen chamber. The following morning final preparations were made for surgery. Morphine sulfate, ¼ gr., and 1/100 gr. atropine sulfate were given hypodermically. Forty-five minutes later, nembutal® was administered intravenously to effect surgical anesthesia. Approximately one-third the calculated dose of nembutal was injected, after which the patient fell into a deep narcosis accompanied by moderate cyanosis. Oxygen was quickly administered with positive pressure and within 15 minutes condition had improved considerably. At this point, another whole blood transfusion of 250 cc. was started and continued throughout the surgical procedures.

Invasion of the peritoneum revealed a tear in the diaphragm extending from the sternum to the vertebral column, and from the midline to the costodiaphragmatic juncture on the left. The torn edges had turned back and healed to themselves; leaving a perfectly formed fistula through which the entire stomach and two-fifths of the liver were prolapsed. Left lung capacity was estimated at 10% of normal. The stomach and liver were firmly adhered to the pleura and pericardium. As these adhesions were gently separated, there was con-

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®Abbott Laboratories, Inc., North Chicago, Ill.

siderable diathesis and after 15 minutes, ventricular fibrillation began to develop. The patient succumbed after 18 minutes of thoracic exposure.

Oxygen in Acute Pulmonary Distress

Case 3. An 11-year-old, female Cocker Spaniel was presented in acute pulmonary distress. This dog had been referred to the authors several months previously for follow-up care after a severe macrocytic anemia. This animal was known to be heavily infested with heartworms but treatment was considered inadvisable in view of age and general physical condition. The night of admission was sultry. Temperature was recorded at 104 F. and the patient was quite cyanotic; breathing was audibly labored. The animal had been in good condition that morning; severe distress was evident to the owner when he returned from work in the evening.

A tentative diagnosis of pulmonary embarrassment was made, and 100 mg. aureomycin were given orally and an expectorant intramuscularly. The patient was then placed in the oxygen chamber. The ice compartment was filled to capacity with crushed ice and oxygen introduced into the chamber at 60 lb. pressure with all ports closed. Moderate relief was noticeable within 30 minutes; however, a full three hours elapsed before respiratory rate had returned to normal. At this time cyanosis was only slightly in evidence. The dog was held in the chamber for 26 hours, at which time temperature was 101 F. and when removed the patient was able to maintain normal activity on room air with no signs of discomfort. The animal was discharged and the owner advised of the probability of recurrence. The following evening the dog was presented with moderate distress. After three hours in the chamber, symptoms were again relieved and within the last six months there has been no recurrence.

Oxygen Use in Surgical Shock

Case 4. A two-year-old Chihuahua, with a nonunion of the right femur of three weeks' duration, was presented. An open reduction was performed with amputation of the healed ends and an intermedullary pin applied. The surgery required a total of 1¾ hours. Evidence of shock became apparent after 45 minutes. Oxygen was administered by endotracheal tube during the completion of the procedure, and immediately following surgery the animal was placed in the chamber, wrapped in a flannel blanket. Little ice was added to the ice compartment. Fifty cc. of plasma were also given; 25 cc. at the first sign of shock and 25 cc. as soon as the surgery was complete. At the end of 2½ hours, the patient was well out of danger and was removed from the chamber. Recovery was uneventful. Shortening of the limb was an inevitable sequela.

Oxygen in Traumatic Shock

Case 5. A two-year-old, male Boxer was presented within 30 minutes after a side blow to the head from an automobile. There was extensive hemorrhage of the right sclera and the beginning of swelling of the entire right side of the head. The patient had vomited blood twice on the trip to the hospital. Hemostatic solution, (Jen-Sal) 10 cc. was injected intramuscularly and 100 cc. of plasma given subcutaneously. The animal was then placed in the oxygen chamber. Salivation and dyspnea began to disappear almost immediately. When removed from the chamber two hours later, the dog was almost normal. Local treatment of the bruised area was required, but no other alarming symptoms developed after discharge, 24 hours later.

Oxygen for the Newborn

Case 6. A seven-year-old, mixed breed female was presented, with dystocia. The posterior half of a puppy was protruding from the vulva. Upon questioning the owner carefully, it was determined that the pup was presented at this position 15 minutes before arriving at our office. Moderate traction applied to the hind legs effected delivery of the pup, which was followed by the detached placenta. No heart beat could be felt and since the newborn was quite cyanotic, the owner was assured that it was not alive. He refused to accept this statement and urged us to "do all that is possible." This discussion, together with actual delivery, consumed another five minutes, so that the pup had been without benefit of oxygenation either from the mother's circulation or from outside air for a total of 20 minutes.

Upon the owner's insistence, a combination of oxygen 95% and carbon dioxide 5% was administered directly into the mouth while simultaneously applying artificial respiration with our fingers. For fully three minutes there was no response. The writer was just ready to insist that all efforts were futile when the pup made a gasping motion. After continued efforts for five minutes, it was able to breathe the mixture. Cyanosis disappeared. The pup was kept on this mixture for approximately

30 minutes, at the end of which time it was unable to breathe room air adequately, although a relatively normal state of oxygenation was maintained as long as the mixture was available. After placing in a small oxygen chamber, the newborn began to cry for food and move about.

At this point, the owner decided to try his luck with oxygen at home since he was financially unable to leave the mother and pup in our care. Arrangements were made with a local supply company to meet him at home with a small tank of oxygen. This was run into a pasteboard box with the top closed down on the tube, thus providing an escape opening at the other end for the carbon dioxide. The pup survived the night and was presented six weeks later for routine examination.

Caution should be taken from the above that merely passing oxygen into a chamber without proper circulation and facility for removing CO_2 and body heat may only prove satisfactory as an emergency measure. Proper therapy requires consideration of the above factors.

Herein have been outlined briefly some of the case records in the files at our hospital, in which oxygen has been used. Since in no case is oxygen the only therapeutic agent administered, it is impossible to draw specific conclusions from its use. During the past five years, this gas has been administered for significant periods of time to over 1,000 animals suffering a variety of disease conditions. It has become a routine agent in the authors' practice and its continued use has been quite gratifying. It is administered routinely to all animals exhibiting respiratory distress; to all injured animals with evidence of shock or hemorrhage; to all newborn which have been subjected to prolonged delivery. Mortality rate has been appreciably reduced through its use, particularly in the newborn.

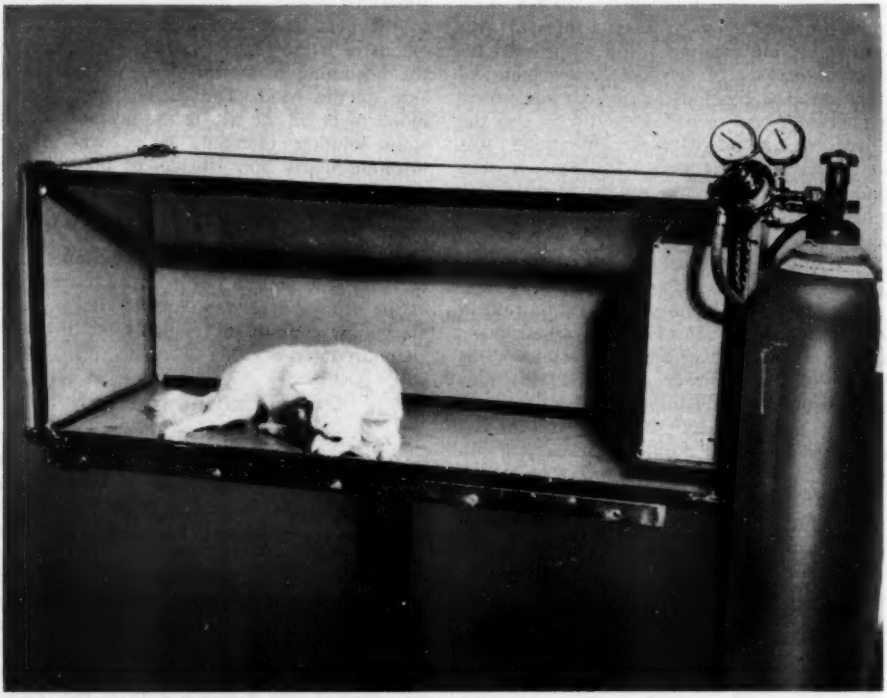

Fig. 2. Animal chamber for oxygen therapy. Constructed of aluminum angle, waterproof masonite and clear lucite, this apparatus allows easy observation of the patient, provides for regulating oxygen concentration and temperature control. Note ice compartment on the right.

One client, who is a breeder of champion Siamese cats, has a tank of O_2 and CO_2 at her establishment. This equipment is in regular use under our direction, and has enabled this breeder to save a number of these valuable kittens in circumstances under which they previously would have died.

Charges for the administration of oxygen to animals are based on the length of time it is administered, the outcome of the case, and the ability of the client to pay. Very little resistance to the use of oxygen in small animal practice or to reasonable charge for its use has been encountered.

Precautions and Supplementary Suggestions in the Use and Care of Oxygen Equipment

The mechanics of administration of oxygen to small animals have been pointed out. There are also certain precautions in its use which should be considered.

Oxygen in a full cylinder is under a pressure of more than 2,000 lb. per square inch. A pressure-reducing regulator must be attached to the cylinder valve outlet before the high pressure cylinder may be used safely. The regulator, in addition to reducing the high pressure of oxygen from the cylinders, also permits the fine control of flow rate. Improvised units to permit oxygen administration directly from the cylinder, without a regulator, are hazardous to both the patient and the operator.

Never use oil, grease, or greasy substances on an oxygen regulator, cylinder valve, or any oxygen connection.

Although oxygen itself does not burn, it strongly supports combustion. Any substance which burns in air will burn more readily and violently in a high concentration of oxygen.

Oxygen equipment should be labeled conspicuously with a warning against smoking. The no-smoking rule must be strictly enforced for personnel and visitors.

Within an oxygen chamber, all sources of combustion, such as candles or other open flames, and electrical devices, such as heating pads or fans, must be prohibited. Cylinders should be secured in such a manner that they cannot be overturned.

Oxygen cylinders containing 244 cu. ft. of O_2 are recommended as the most economical to use.

The admixture of oxygen with other gases, particularly ether, produces a gas which has far greater explosive qualities than either when used separately. In the north, where ventilation is at a minimum during the cold months, the use of oxygen with ether is quite dangerous unless the room in which it is used is equipped with spark- or explosion-proof wall plugs. No electrical appliance should be in use in a room in which this mixture is administered. Electrocautery machines and *x*-ray machines are particularly dangerous.

Although cyclopropane possesses several qualities which indicate that it would be a useful anesthetic agent in small animals, it is so extremely explosive that its use should be reserved for especially designed facilities.

Although the average veterinarian is quite accustomed to building or modifying existing equipment to suit his own use and taste, it is easily demonstrable that this time-worn trait is a distinct failing as far as oxygen and oxygen equipment is concerned. The efficiency of the average home-designed oxygen chamber is so low as compared to the available commercially prepared units that in most cases chemical analysis of the gases within the chamber after one hour of administration of oxygen will conclusively demonstrate a concentration of oxygen within the chamber which is little, if any, above the concentration of the outside air. Most such units fail to allow for sufficient escape of carbon dioxide. It is not unreasonable to assume that developments in the near future will make adequately designed, efficient oxygen equipment available to the average practitioner.

Discussion

In the radical procedure of thoracic surgery of the type discussed herein, the foremost problem confronting the surgeon is to maintain adequate oxygenation of the blood while the thoracic cage is open. Since the opening of the thoracic cage will partially or completely collapse the lungs and minimize inflation and deflation of this organ, it is essential that the conditions for diffusion respiration of the type described by Draper and Whitehead[10] be maintained. This condition is that a high oxygen concentration, with almost complete elimination of nitrogen from the lung, be maintained.

In addition, it is important that a slight continuous pressure be maintained to keep the lung partially inflated so that circulation and gas interchange is not too markedly interfered with. It is also desirable to utilize occasional intermittent pressure to promote inflation and deflation of the lung in order that carbon dioxide be eliminated. Lastly, because partial pneumothorax is almost invariably present immediately following the surgical procedure, it is important that the animal be placed in an atmosphere of oxygen for a period sufficient to permit complete airtight closure of the thoracic cage opening and absorption of any air which might be present in the pleural cavity.

The use of the endotracheal apparatus permits administration of high oxygen concentra-

tions, with moderate continuous positive pressure at all times. This apparatus also can be used to administer intermittent pressure from time to time during the operation. The animal chamber offers a cool, air conditioned, oxygen atmosphere which can be maintained indefinitely to permit the animal to survive the hazardous postoperative period. It also is of value in any case of respiratory distress.

Summary

A paper is presented in which the history of the investigational use of oxygen to animals is traced. An oxygen administering apparatus is described in detail, including the surgical and medicinal aspects of its use. This equipment is a modification of previously described equipment;[12] however, the equipment presented in this paper is designed specifically for animal use. A representative group of case records are presented which give a variety of indications for the use of oxygen in small animals. The results of an intensive five-year use of oxygen is presented. Some of the precautions which should be followed whenever oxygen is used are discussed.

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Experimental Production of Gut Edema in Swine

In a communication from J. F. Timoney, M.R.C.V.S., Veterinary Research Laboratory, Dublin, Ireland, the world-wide incidence of edema disease in swine is cited. In addition to Great Britain, the disease is present in Holland and Norway. It has been reported in South Africa, and, as Midwest practitioners are aware, it recently has become a serious threat in swine droves of the Corn Belt.

The following extracts are from Mr. Timoney's letter:

"It is a very interesting disease and relatively easy to reproduce experimentally with the supernatant fluid of centrifuged intestinal contents given slowly through a very small bore hypodermic needle into one of the ear veins. The intestinal material is often scanty in amount and thick in consistency, and on centrifuging yields only a very small amount of fluid which will be insufficient to reproduce the disease.

"In other cases, the contents will be present in fair quantity and sufficiently fluid so as not to require dilution with saline. In these cases, the supernatant fluid can be used direct after centrifugation. In order to obtain a greater yield of toxic material from the latter type of case, washing out the bowel with 50 ml. of saline or possibly more is indicated, but such material should be extracted as previously mentioned.

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Consolidation of the National Livestock Loss Prevention Board and the Livestock Sanitary Committee has been announced following a meeting of the directors of both organizations. The new agency will be known as Livestock Conservation, Inc., and will have offices in the Livestock Exchange, Union Stockyards, Chicago.

Livestock Conservation, Inc., will be governed by a 45-man board of leaders from all segments of the livestock and meat industry and allied service organizations. Dr. J. R. Pickard, general manager of both the loss prevention board and the sanitary committee, will be general manager of Livestock Conservation, Inc.

The consolidated educational and research organization will carry forward the programs of the parent organizations. Principal attention will be given losses from disease, parasites, and injuries on farms and during the marketing process.

An Outbreak Of Porcine Listeriosis

C. F. HELMBOLDT, B.S., D.V.M., M.S., Ph.D., R. E. JACOBS, B.S., M.S., and L. I. CASE, D.V.M., V.S.*

LISTERIOSIS in swine is apparently an uncommon disease judging by the reports in the literature. Ovine listeriosis was recognized in Connecticut in 1936, but the disease had never been reported in swine in this state[7].

It was first reported in swine in 1938[21] and resembled swine pox, but Gram-positive rods were isolated from the lesions. On the basis of cultural and biochemical methods, the organism was considered to be a Listeria and the name *Listerella suis* was proposed.

The organism has been isolated from the liver of ill pigs,[4,13] from the liver of a hog dead of lye poisoning,[9] and from the liver, spleen, and kidney of a hog dead of hog cholera[14].

Outbreaks occurred in several Iowa herds, in which hogs up to 150 lb. were affected, although the disease predominated in suckling pigs[1]. The symptoms varied and consisted of posterior paralysis, stilted gait of the forelegs suggesting tetanus, "shivering", particularly of suckling pigs, and incoordination. *Listeria monocytogenes* was recovered from the brain of affected swine and shown to be pathogenic to rabbits and swine on intracerebral inoculation. Gross examination of field cases was negative. Histopathologic examinations of the brains revealed perivascular cuffs characterized by monocytic elements, mononuclear foci, and considerable numbers of heterophils. Hematologic studies revealed monocytosis.

Observations

History and Symptoms. A herd of 450 Duroc-Jersey swine of various ages sustained losses which were confined to a group of 175 six to eight-month-old hogs. In the preceding two months, 12 swine had died of a progressive paralysis of the limbs. Two to three weeks after the onset, the paralysis was almost complete, accompanied by marked dyspnea, and death ensued.

A live, alert, six-month-old gilt, ill for two weeks was presented for necropsy. Temperature was 102 F., respiration was labored and 60 per minute. The animal was barely able to manitain itself in a sternal position since all four legs were partially paralyzed. Painful stimuli of the legs elicited protesting squeals. The gilt was chloroformed and exsanguinated.

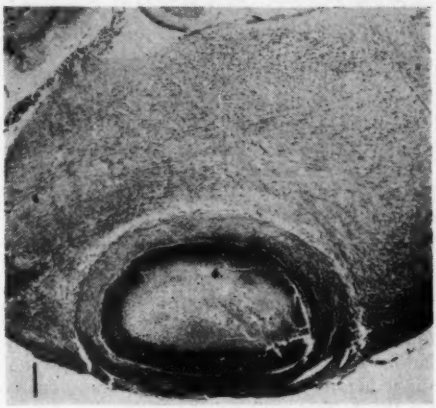

Fig. 1. Sagittal section of the medulla oblongata from a six-month-old hog ill with listeriosis, showing a necrotic focus surrounded by a fibrous capsule. HCHO HH trios, 40X.

Hematology. Total erythrocyte count was 7,040,000 per cmm., total leukocyte count was 23,350 per cmm., the hemoglobin was 14.5 gm. per cent by the Haden-Hauser hemoglobinometer, and the differential leukocyte count expressed in per cent was monocytes 0, heterophils 86, basophils 0, lymphocytes 14, and eosinophils 0. Polychromatophilia and macrocytosis were common features of the erythrocytes. Monocytosis was not present in this instance, a fact often observed in sheep[8].

Bacteriology. Cultures of the heart, liver, lung and brain stem were streaked on blood agar plates and incubated for 48 hours at 37 C. under 10% CO_2 tension. Cecal and colonic contents were inoculated into Selenite broth and incubated for 18 hours at 37 C.; the broth culture was streaked on SS agar plates. Growth was observed only on those plates streaked with brain and lung material and consisted of small, weakly beta-hemolytic colonies of nonmotile, Gram-positive rods. On tryptose agar, the colonies were grayish translucent in character. Slight acid was produced in the follow-

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ing fermentation broths: arabinose, dulcitol, glucose, lactose, maltose, mannose, rhamnose, salicin, sucrose and xylose, but no changes were produced in dextrin, fructose, galactose,

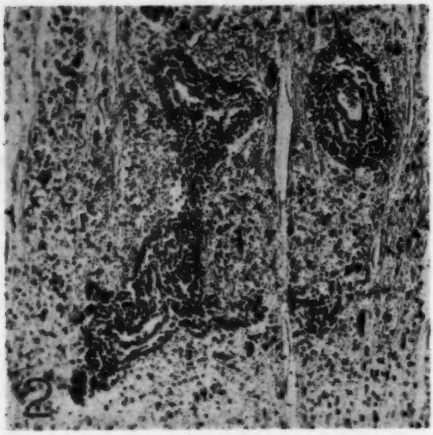

Fig. 2. Sagittal section of the medulla oblongata from same hog as fig. 1, showing perivascular infiltrates and a glial focus. HCHO HH trios, 100X.

glycerol, sorbitol, and starch. The organism failed to liquefy gelatin, to produce H_2S or indol, and to utilize urea, but did produce slight acidity in litmus milk. It was negative for the methyl red and Voges-Proskauer tests. These reactions fulfilled the requirements of *Listeria monocytogenes* with the exception that the attack on dulcitol was not in accord with the usual observations[8].

Eight two-month-old white mice were each inoculated intraperitoneally with 0.5 ml. of brain tissue suspended in normal physiological saline as follows: two mice with a 1:1 suspension, two mice with a 1:10, and two mice with a 1:100 suspension. The first two mice died within 12 hours; cultures and sections of the heart, liver and spleen were negative. The second two mice were normal one week later, at which time they were killed and the same cultures and sections taken. One mouse showed focal necrosis of the liver and yielded Gram-positive rods in liver smears. Other sections and cultures were negative. The last two mice were normal two weeks postinoculation at which time similar sections and cultures were taken again with negative results. No serial passages were attempted.

Two two-month-old white mice were each inoculated intraperitoneally with 0.5 ml. of a 1:100 suspension of tissue. Both were normal one week later, but lung impressions revealed many Gram-positive rods. Cultures and sections were negative.

A guinea pig was inoculated in the conjunctival mucosa with a blood broth culture, with negative results.

The organism appeared to be nonpathogenic for laboratory animals in the amounts employed.

Gross Pathology. The lungs of the gilt were markedly edematous and positive to the swim test. The bronchi and trachea were filled with a white foamy exudate. Other organs were considered normal.

Histopathology. Formalin fixed sections stained by Harris' hematoxylintriosin, were taken of the brain, heart, liver, kidney, spleen, adrenal, stomach, duodenum, ileocecal valve, and colon of the gilt. Dobell's modification of Levatidi's silver stain was applied to the liver and kidney for demonstration of Leptospira.

A 3 mm. ovoid body surrounded by a fibrous capsule and consisting of fine granular eosinophilic material in the center was seen in the anteroventral portion of the medulla. (Fig. 1.) When special Gram pyronine stain was applied to this focus, numerous short Gram-positive rods were seen. (Fig. 4.) The area adjacent to the focus presented perivascular infiltrates of mononuclear elements with a few heterophils, and diffuse foci. (Fig. 2 and 3). The lung was markedly edematous. Other sections were considered normal.

Comment

Infectious diseases of the brain are ordinarily divided into purulent and nonpurulent

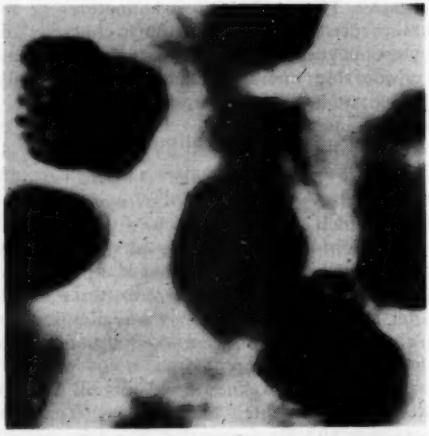

Fig. 3. Higher power of a perivascular infiltrate seen in fig. 2, showing two granulocytic leukocytes. HCHO HH trios, 2900X.

encephalitides[20]. In a broad sense, viral diseases produce nonpurulent encephalitis whereas bac-

terial diseases tend to produce a purulent form. In the reported case, both forms existed simultaneously. However, the histologic descriptions of Biester and Schwarte,[1] plus the findings in

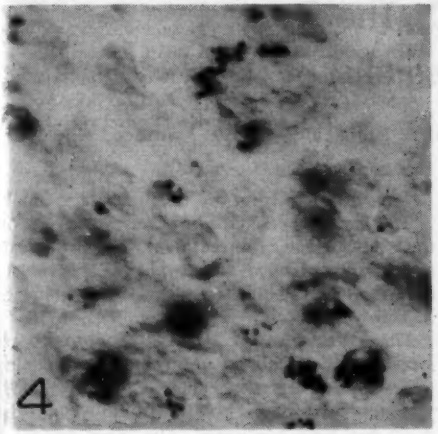

Fig. 4. Necrotic material of the focus seen in fig. 1, showing groups of *L. monocytogenes*. Some organisms are within phagocytic cells. HCHO special Gram pyronine stain, 1450X.

ruminants and other animals as encountered at this laboratory,[7] lead the authors to believe that listeriosis in swine occurs chiefly as a nonpurulent encephalitis and that the lesions are confined to the brain stem and cerebellum.

There are four other diseases, all of viral origin, which may cause nonpurulent encephalitis in the hog. These are; hog cholera,[9,15,18,19] Aujeszky's disease,[10,16,17] Teschen disease,[5,9,12] and rabies[11]. Listerial encephalitis can be differentiated from the viral diseases by the following: (1) Neuropathologic lesions in listeriosis are confined to brain stem and cerebellum; (2) heterophils are usually seen in the brain lesions; (3) bacteriologic methods enable one to isolate the causative organism; (4) animal inoculations into hosts other than swine are ordinarily useful since hog cholera and Teschen disease occur only in the hog.

Diagnosis by clinical means alone may be difficult. The progressive paralysis, the morbidity, the history in the outbreak, resembled those of Teschen disease[5,9,12] and Aujeszky's disease[10,16,17].

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Cumberland County, Maine, has completed an area test for brucellosis. The number of cattle tested was 10,291 in 1,371 herds. Herd infection rate was 1.5%; 21 reactor herds. Cattle infection was 0.34%; 35 reactors and 46 suspects.

Further Studies On The Chemical Treatment Of Soil Infected With Larvae Of The Dog Hookworm (*Ancylostoma caninum*)

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ADDITIONAL data have been accumulated on the effects of various chemical agents in the treatment of soil infected with larvae of the dog hookworm (*Ancylostoma caninum*). This information supplements to a great extent that which was presented in a previous report[1] and will be referred to continually in this article.

In the previous work, eight chemical agents were tested in artificially contaminated soil bins and naturally infected dog runs. In general, the results indicated that methyl bromide fumigations and sodium borate applications are effective. Urea solution, calcium cyanamide, and dichloropropene are fairly effective. Ethylene dibromide is relatively ineffective. It was thought that the chemicals spread on the soil surface, such as sodium borate, urea, and calcium cyanamide, were the most practical to apply. In toxicity tests, calcium cyanamide was toxic when given internally, sodium borate was determined to be less toxic when given internally, and methyl bromide is assumed to be non-toxic if proper aeration is allowed after fumigation[1].

The literature was reviewed in the previous article[1].

Methods

Field Methods. Part of the experimentation was done on contaminated soil contained in concrete bins measuring 6 x 12 feet. These bins consisted of Norfolk sandy loam and Cecil sandy loam. The other soil plots used measured 6 x 6 feet and were separated by galvanized sheet metal. This soil was of the Cecil sandy loam type. Dog feces containing eggs of *A. caninum* was spread on the soil surface from two to four times prior to treatment. The fecal material was finely raked and chopped into the soil surface. Immediately before treatment a concentrated solution of third-stage hookworm larvae (*A. caninum*) was sprinkled on the soil surface. Pretreatment and post-treatment samples were taken just as previously described except that only the top two inches of soil were taken[1].

Observations of the effects of sodium borate were made on three naturally infected dog kennels. One of these kennels (field trial 1) was reported upon previously; however, the work has been continued. The other two kennels will be described later in the course of the article. Five soil samples (four corners and center) were taken from each run to a depth of two inches.

All three of these field tests were of some distance from Auburn and this investigator was forced to rely upon the owners of the kennels concerned to perform the tasks of treatment and husbandry procedures. When the samplings were taken periodically by the author, the owner was quizzed as to his practices since the last visit. It was because of existing conditions that accurate control runs were not kept. However, as far as the author knows, the practices of sanitation were not varied nor changed, and all of the material reported upon in this article is correct.

Laboratory Methods. The laboratory procedures of pooling the soil samples, pulverizing, mixing and Baermanizing 100 gm. for a period of three hours were carried out. Counts were initially made on the total number of larvae (parasitic and nonparasitic) present in the filtrate. The Shorb[2] technic for *Haemonchus contortus* was used as a differential counting aid. This procedure involves the use of concentrated hydrochloric acid which is added to the larval solution in dilution of 1:30. The third-stage hookworm larvae remain alive while free-living nematode larvae die. The above laboratory technics were identical to those previously described in detail[1].

A modification of the Lane direct centrifugal flotation method of quantitatively examining feces was used as described by Stoll[3,4].

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Field Test 1

The work in the original kennel (field test 1) was continued throughout the year. The owner was highly pleased with the results of his use of sodium borate. He reported that his puppy loss had been negligible, and that their gains had been much better due to their lower incidence of hookworm infection. He had noticed no toxic effects from its use. Even though periodic treatment of soil was performed, all the standard sanitary practices of raising puppies were carried out. The previous history of this work has been reported[1]. The recent larval counts in these dog runs are summarized in table 1.

On August 2, 1950, fecal droppings were obtained from the dogs in runs 3, 4, and 5. The numbers of hookworm eggs per gram of feces were 10, 0, and 0, respectively. This result was a favorable indication that effects of the dog hookworm had been minimized.

A series of artificially contaminated soil plots were tested with various chemical compounds. After removing the vegetation, these plots were artificially contaminated with infective dog feces as previously described. The six chemicals used were as follows:

(a) Boron compounds (Pacific Coast Borax Co.): (1) Sodium borate (borascu), described in previous article;[1] (2) anhydrous sodium borate (concentrated borascu), previously described;[1] (3) calcium sodium borate (Gerstley borate), previously described;[2] (4) sodium pentaborate (polybor)—a fine granular salt consisting of sodium pentaborate ($Na_2B_{10}O_{16}\cdot 10H_2O$) 77%, borax ($Na_2B_4O_7\cdot H_2O$) 21%, inert ingredients 2%—it is quite soluble and is spread evenly on the soil surface.

(b) Calcium cyanamide (aero cyanamid—special grade, American Cyanamid Co.), previously described[1].

(c) Sodium chloride (granulated table salt)—this product is well known to everyone.

The results of larval counts in pretreatment and post-treatment samplings are summarized in table 2. The six post-treatment samplings during the 55-day period were taken at weekly intervals. The efficacy of the agents is based on the percent of viable larvae in the post-treatment samples to that of the larval count in the pretreatment samples. For example, the control plot in Norfolk sandy loam had as a pretreatment total larval count 260 larvae. The average count of all the post-treatment samplings was 151 larvae ($905 \div 6 = 151$). Then the average percent of viable larvae remaining in the post-treatment samplings was 58.1% ($151 \div 260 = 58.1\%$).

The experiments were carried on in a rainy period so that the chemicals dissolved quite quickly after being spread on the soil surface. The results demonstrate the efficiency of boron and the lesser effectiveness of calcium cyanamide and sodium chloride. The only borate not completely destroying larvae was the calcium borate preparation. However, it is believed that the effect of this borate might be more residual because of its less soluble characteristics.

TABLE 1. Sodium Borate in Field Test 1 (2nd Year)

Date dog run	1/15/50 Treated lb./100 sq. ft.	2/8/50 Larvae/100 gm. soil T* / H	5/9/50 Larvae/100 gm. soil T / H	5/14/50 Treated lb./100 sq. ft.	7/13/50 Larvae/100 gm. soil T / H	8/2/50 Larvae/100 gm. soil T / H
	20	940	0	20	0	20
1		160	0		0	0
2	20	280	0	20	64	0
		80	0		40	0
	20	80	80	20	1,100	20
3		0	15		80	15
	20	20	0	20	120	0
4		0	0		0	0
	20	20	30	20	20	0
5		0	0		0	0

*T — total larvae
H—hookworm larvae

Field Test 2

This series of samplings was done on a kennel containing Pointers, Setters, and Hounds. The animals were kept under crowded conditions, some small runs housing four and five dogs. In addition to this, sanitary practices were not properly performed. It was observed that fecal droppings in this kennel were not removed regularly, sometimes not for two to three days.

On August 2, 1950, fresh feces from dogs on runs 1, 3, 4, 5, and 7 were examined for hookworm eggs. The numbers of eggs per gram of feces were 384, 140, 708, 56, and 74, respectively. These results indicated that these dogs were heavily parasitized, and that they were constantly reinfecting the soil because of improper vermifuging methods and sanitation procedures. However, in spite of these existing conditions, the results of periodic samplings of soil reveal a reduction of numbers of larvae. Table 3.

TABLE 2. Various Chemicals on Experimental Plots (55 Day Period)

Chemical	Method of application	Rate of application in lb. per 100 sq. ft.	Average % of viable larvae in 6 post-treatment samplings. T*	H
		Norfolk Sandy Loam		
Anhy. sodium borate	Spread	5.4	0	0
Sodium penta-borate	Spread	6.4	0	0
Untreated control	—	—	58.1	95.5
		Cecil Sandy Loam		
Sodium borate	Spread	10.0	0	0
Same	Spread	10.0	0	0
Untreated control	—	—	14.6	16.6
Calcium sodium borate	Spread	9.5	11.1	10.4
Same	Spread	19.4	5.5	0
Same	Spread	9.5	0	0
Untreated control	—	—	28.5	8.3
Calcium cyanamide	Spread	8.3	31.9	0
Sodium chloride	Spread	27.8	3.8	0
Sodium chloride solution†	Sprinkled in solution	31.3 lb. in 10 gal.	4.8	8.4
Untreated control	—	—	63.9	166.6
Anhy. sodium borate	Spread	5.5	0	0
Sodium penta-borate	Spread	6.4	0	0
Same	Spread	13.0	0	0
Untreated control	—	—	128.1	562.5

*T — total larvae
H — hookworm larvae

†Tested over 13-day period, two post-treatment samples.

Field Test 3

This was a kennel concerned in raising and training Pointer dogs. These dog pens had been stationary for some 20-odd years. However, the dogs were well cared for, and fecal droppings were removed at least twice daily. In spite of this care, much difficulty has been experienced with clinical ancylostomiasis.

Treating the soil was done by kennel men, and it was discovered later that not 10 lb./100 sq. ft. were used, but approximately 6-7 lb./100 sq. ft. However, the results of the post-treatment samplings as tabulated in table 4, demonstrated a remarkable reduction in soil larvae. Upon fecal examination on August 2, 1950, the samples showed a fairly low incidence of hookworm eggs. From runs 5, 6, 7, 9, and 12; the numbers of eggs per gram of feces were 4, 80, 2, 14, and 24, respectively.

Discussion

In the data obtained from the experimental plots, it is evident that the borates are toxic to both the free-living larvae and to the parasitic larvae present in the soil. Sodium borate, anhydrous sodium borate, and sodium pentoborate seem to be of equal effectiveness. Sodium borate is the least expensive pound for pound; however, dehydrated sodium borate is actually cheaper, since less is needed because of its dehydrated properties. On the other hand, results are proportional to coverage and better coverage is usually obtained when more material is handled. Therefore, probably sodium borate (borascu) is still the substance of choice.

Sodium chloride and calcium cyanamide were not as complete in larval eradication as were the above borates. These substances had a marked effect, however. Calcium cyanamide seems to have a peculiarly selective action upon the hookworm larvae and not upon the nonparasitic larvae. More investigation needs to be done on this chemical.

The observations in the field tests, where infection occurred naturally, probably were somewhat significant. In field tests 1 and 3, as summarized in tables 1 and 4, and from the corresponding fecal examinations given, it is established that soil treatment with sodium borate, together with good canine husbandry methods, is of great aid in controlling ancylo-

TABLE 3. Sodium Borate in Field Test 2

Run	11/23/49 Pretreat. larvae per 100 gm. of soil T* / H	11/25/49 Treated lb. per 100 sq. ft.	12/9/49 Larvae per 100 gm. soil T / H	2/3/50 Treated lb. per 100 sq. ft.	2/8/50 Larvae per 100 gm. soil T / H	4/15/50 Larvae per 100 gm. soil T / H	6/12/50 Treated lb. per 100 sq. ft.	7/17/50 Larvae per 100 gm. soil T / H	7/25/50 Treated lb. per 100 sq. ft.	8/2/50 Larvae per 100 gm. soil T / H
1	1,120 / 40	10	600 / 60	10	260 / 0	300 / 0	10	60 / 20	10	20 / 0
2	240 / 12	10	60 / 60	10	756 / 180	280 / 0	10	80 / 0	10	0 / 0
3	120 / 0	10	0 / 0	10	840 / 0	150 / 30	10	240 / 0	10	20 / 20
4	216 / 0	10	20 / 0	10	240 / 0	0 / 0	10	280 / 0	10	60 / 0
5	696 / 0	10	200 / 40	10	160 / 0	120 / 0	10	40 / 0	10	40 / 0
6	3,800 / 0	10	40 / 0	10	140 / 0	105 / 0	10	280 / 0	10	15 / 0
7	260 / 0	10	760 / 0	10	160 / 20	320 / 0	10	0 / 0	10	0 / 0
8	140 / 0	10	0 / 0	10	228 / 0	90 / 20	10	640 / 0	10	180 / 20
9	1,720 / 0	10	440 / 20	10	600 / 0	495 / 0	10	480 / 0	10	40 / 0

*T—total larvae
H—hookworm larvae

stomiasis. In field test 2, the results of which are given in table 3, the husbandry methods were poor. In this instance, soil treatment with sodium borate was not as effective.

Besides the field work observed in this paper, there have been several other kennel men, trainers and breeders of bird dogs, who have used sodium borate. In this area, three other such men have stated their satisfaction in soil treatment with this substance. Soil treatment, in their opinion, is an effective aid in conjunction with good dog raising methods in controlling the dog hookworm.

Toxicity

There have been no reports of toxicity from the use of sodium borate in soil treatment.

In addition to the toxicity experiments upon older dogs which were reported previously,[1] one other experiment has been conducted. Two mongrel puppies, eight weeks of age, were fed 1.5 gm. of sodium borate (borascu) daily for seven days. The hemograms in pretreatment and post-treatment occasions are summarized in table 5. Both dogs externally showed no ill effects, no loss of weight; and appetite remained normal. However in table 5, it will be noticed that a marked degree of hemopoetic depression was evident in both dogs. It will be noticed that the total white count in both cases dropped significantly. In puppy 2, the latter count of 7,950 as compared to the former count of 23,750, signifies a drastic reduction. However, it is also observed that both of these dogs evidenced an elevated total white cell count at the initial observation.

This resulting leukopenia and anemia were also noticed in previous toxicity experiments[1]. In these experiments, this effect was a transient one, recovery resulted when treatment was discontinued.

TABLE 4. Sodium Borate in Field Test 3

Run	6/7/50 Pretreat. larvae/100 gm. soil T* / H	6/7/50 Treated lb. per 100 sq. ft.	6/15/50 Post-treat. larvae/100 gm. soil T / H	7/17/50 Post-treat. larvae/100 gm. soil T / H	8/2/50 Post-treat. larvae/100 gm. soil T / H
1 Adult dogs	0	7	0	40	20
	0		0	0	0
2 Adult dogs	120	7	0	0	0
	20		0	0	0
3 Adult dogs	100	7	0	0	0
	30		0	0	0
4 Adult dogs	200	7	15	0	0
	60		0	0	0
5 Adult dogs	220	7	0	0	20
	60		0	0	0
6 Adult dogs	660	7	15	0	0
	40		15	0	0
7 Puppies	100	7	20	120	0
	10		0	0	0
8 Puppies	120	7	0	0	20
	15		0	0	0
9 Puppies	20	7	20	40	900
	6		0	20	40
10 Puppies	60	7	20	60	580
	10		0	0	180
11 Adult dogs	60	7	0	20	0
	10		0	0	0
12 Adult dogs	160	7	0	40	80
	15		0	0	0

*T—total larvae
H—hookworm larvae

Although it is unlikely that a dog would ingest such large amounts of chemical under normal conditions, it would be well to avoid feeding dogs off the ground in freshly treated soil.

Recommended Procedures in the Control of Canine Ancylostomiasis in the Southeastern United States

1. Deworm dogs with tetrachlorethylene and a non-oily laxative.

2. Place the dewormed dogs upon runs which have been freshly treated with sodium borate (borascu). This should be applied at the rate of 10 lb. per 100 sq. ft.

3. Remove fecal droppings daily.

4. Repeat the above first two steps at from four to eight-week intervals during the spring and summer months, depending on the type of soil and degree of infestation of the dogs. Light soil should be treated more frequently than heavy soil.

5. Pregnant bitches should be dewormed during gestation according to the degree of infection. Bitches should be kept on parasite-free ground. Many successful breeders keep whelping bitches and their litters on wire until the puppies are six to eight weeks of age.

6. If clinical ancylostomiasis and anemia occur in puppies, deworming, blood transfusions, and the daily oral administration of 2.5 to 5 gr. of ferrous sulfate are good practices. Additional therapy might consist of injections of 0.5 to 1 cc. of crude liver extract and 0.5 to 1 cc. of vitamin B_{12} may be given twice weekly.

Conclusion and Summary

1. Evaluation of six different chemicals on artificially contaminated soil plots was performed. The borates appear to be the most effective.

2. The results of three field tests using sodium borate as the soil larvacide are given. Two of the three, in which good canine husbandry was practiced, showed excellent results; the other test in which poor husbandry was practiced showed less benefit.

3. An outline of the control of canine ancylostomiasis in dog runs with dirt floors is given. It is felt that when soil treatment with a satisfactory larvacide such as sodium borate is used in conjunction with good husbandry methods, the dog hookworm can be controlled.

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Acknowledgment

The author is indebted to Helen T. Whitsett and Thomas Needham for technical assistance; to Dr. Dale Porter for professional advice, and to the various companies whose products were used.

TABLE 5. Toxicity of Oral Administration of Sodium Borate

	Puppy 1 before administration	2 months' old-after 1.5 gm. daily for 7 days—oral	Puppy 2 before administration	2 months' old. after 1.5 gm. daily for 7 days—oral
R.B.C.	4,360,000	4,250,000	3,120,000	2,920,000
W.B.C.	22,500	13,400	23,750	7,950
Neutrophils %	49	65	58	60
Lymophocytes %	44	33	42	37
Monocytes %	0	1	0	1
Eosinophils %	6	1	0	2
Basophils %	1	0	0	0
Weight of animal	3 lb.	3½ lb.	2 lb.	2¼ lb.
Appetite	Good	Good	Good	Good

Response Of Veterinarians To Public Law 779*

IT is believed the reasons for the passage of Public Law 779, the so-called Draft-Doctors Act, are known to those affected by it and to others having an interest in the operation of the law, and stating these would be superfluous. Rather, the purpose of this article is to supply members of the profession with certain information of current interest. The preceding statement is based on questions not infrequently asked by many such members. Some of these questions are: How many veterinarians affected by the law accepted Reserve commissions? Of these, how many volunteered for extended active duty? Does the number of veterinarians accepting commissions and volunteering compare favorably with the physicians and dentists respectively? When all with commissions in the Veterinary Corps Reserve who volunteered for extended active duty have been ordered into the military service, how will additional veterinary officers be procured in the event more are required? May a veterinarian registered under P.L. 779 still apply for a Reserve commission although initially he indicated one was not desired? How much advance notice will a veterinary Reserve officer ordered into military service receive prior to the effective date of reporting for duty?

Registration Statistics

Latest data available from the Selective Service System are that 8,947 veterinarians have registered under the provisions of Public Law 779, 81st Congress, which was approved on September 9, 1950. Of this number, 1,774 were priority one (having had less than 90 days of active military service after graduation) and 289 were priority two (having had over 90 days but less than 21 months of active military service after graduation).

At the time of registration (October 16, 1950) of veterinarians in priorities one and two, each registrant was required to complete a DD form 390 (Initial Data for Classification and Commissioning). Among other entries on the form, he indicated whether or not he desired a commission in the Veterinary Corps Reserve. A statement that the registrant desired a commission did not imply that the individual would be called to duty immediately after appointment. After registration, the registrants were classified by local boards, and those not otherwise deferrable were ordered to take preinduction physical examinations, and DD forms 390 were forwarded to the appropriate Army area headquarters for processing. As this is written (July 14, 1951), DD forms 390 for 1,527 of the 1,774 priority one registrants have been processed in the various Army areas. The difference between these two figures represents those registrants who were deferred for other than physical reasons and those who may have applied for and received Reserve appointments in either the Army or Air Force during the period between the dates of registration and preinduction physical examination.

Of the 1,527 individual cases processed by Army Headquarters, 871 (57%) stated they desired commissions in the Reserve. The per cent of physicians and dentists who applied for commissions was approximately the same; being 58 and 69%, respectively. Slightly less than 10% of the veterinarians were found physically disqualified. The physical disqualification rate was considerably lower than among physicians and dentists.

Of the 871 priority one veterinarians stating initially that they desired commissions in the Reserve, 447 have been found physically and otherwise qualified for appointment and have received and accepted appointments in the Army, and approximately 125 have received appointments in the Air Force Veterinary Corps Reserve. Approximately 30 veterinarians in other priorities (two, three, four) have applied for and received Army Veterinary Corps appointments.

Since the beginning of the Korean incident on June 25, 1950, 142 veterinarians who registered as priority one under the Draft-Doctors Act, or who would have so registered had they not held Reserve commissions, have entered extended active duty with the Army and 90 with the Air Force. All except ten of this number made voluntary applications for active service. The ten who were called involuntarily by the Army were called early in the expansion period when the voluntary application rate did not meet the rapidly expanding need for additional officers for active duty. Many of the officers classifiable as priority one officers who entered active military service (Army and Air Force) after June 25, 1950 initiated ap-

*Submitted by Veterinary Division, Office of the Army Surgeon General, Department of the Army, Washington, D. C.

plications for Reserve commissions and active duty prior to the actual approval of the Draft-Doctors Act. The voluntary response of the veterinary profession to meet the needs of the Veterinary Corps of the Army and Air Force for additional officers for active duty is most gratifying and one of which the profession may well be proud. Percentage-wise, the voluntary response of veterinarians for commissions and active duty greatly exceeded that of physicians and dentists. The volunteer rate has been so good since August 1950, that the needs for Veterinary Corps officers for active duty have been met entirely by volunteers and during much of the period a backlog of volunteers has existed. Not only has the response from priority one officers been excellent, but also many veterinary Reserve officers who served during World War II have volunteered their services during the present emergency. Furthermore, it can be stated that in practically all letters of inquiry about military service received from veterinarians affected by P.L. 779, appreciation was expressed that the Government allowed them to complete their education and they felt they should serve when needed.

Volunteer List Exhausted

As of this date, the supply of volunteers for service with the Army has been exhausted and unless additional Reserve officers volunteer it will be necessary to call priority one officers involuntarily should the need for additional officers arise. It is hoped that the previous excellent volunteer rate will continue and that it will be unnecessary to call any officer to active duty without his consent.

Future officer requirements for the Army Veterinary Corps will be obtained by ordering into military service those (priority one, P.L. 779) who hold commissions in the Army Veterinary Corps Reserve but did not volunteer for extended active duty. When and if this source of personnel is exhausted, future requirements then will be procured by placing a call on the Selective Service System for the number of veterinarians needed to fill any projected quota. That headquarters will then direct subordinate offices to procure the quota of veterinarians required, first from among those in priority one and, when this source has been exhausted, from those in priority two.

Regarding the question whether a veterinarian who registered under P.L. 779 and who initially declined to apply for appointment in the Veterinary Corps Reserve may still make application; the answer is that he may do so. Also, he may indicate whether he does or does not desire extended active duty. No advantage is gained now with respect to entering grade by postponing making an application for a commission in the Veterinary Corps Reserve, as the grade he would receive would not be higher than that he would have received had he applied initially.

As to how much advance notice an Army Veterinary Corps Reserve officer ordered into the military service will receive prior to the effective date of reporting for duty; normally this is 30 days.

Many are aware that P.L. 779 as originally passed was an amendment to the Selective Service Act of 1948 and was due to terminate on July 9, 1951. Many may not be aware, however, that the Congress in 1951 in further amending the Selective Service Act of 1948 extended the provisions of P.L. 779 to the year 1955; also, the length of service was increased from 21 to 24 months.

The veterinary profession can take pride in the response of the great majority of this group of veterinarians. Their attitude toward service has been excellent. We have confidence it will continue.

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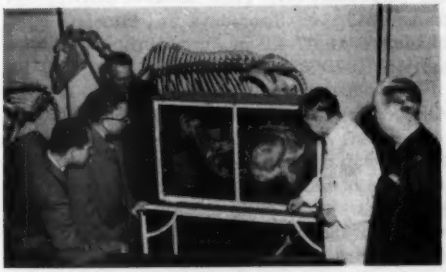
USAF Veterinary Officers Visit Air Force Installations in Europe



Dr. Schauder (white coat), Director of Anatomy at the Giessen Veterinary College, Germany, points out some of his departmental teaching aids to visiting Air Force Medical Service officials.

Left to right are; Dr. Kurt Hueber, German veterinary consultant to the Chief Veterinarian of the U. S. Air Forces in Europe; Dr. Walter R. Krill, Dean of the College of Veterinary Medicine, Ohio State University, and Civilian Consultant to the Surgeon General of the U. S. Air Force; Lt. Col. Willard M. Van Sant, Chief Veterinarian of the USAF in Europe; Dr. Schauder; and Col. Wayne O. Kester, Chief of the USAF Veterinary Service. The Air Force officers participated in a recent two-week visit to Europe made by an official Surgeon General's party.

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Pound for pound, rabbit meat has the same food value as beef.—*S.N.L.*

The *In Vitro* Effect Of Several Antibiotics Against *Vibrio Fetus*†

J. E. PRIER,* D.V.M., M.S., Laramie, Wyoming

INFECTION of sheep and cattle with *Vibrio fetus* is presently recognized as a major cause of sterility and abortion. There has been little reported concerning the therapy of the disease. Haubrich[1] has indicated that 1 gm. of streptomycin by intrauterine inoculation has given beneficial results. The present paper describes preliminary *in vitro* studies of several antibiotics against the organisms.

Materials and Methods

The following bovine strains of *V. fetus* were used in the study: numbers L14,847; L13,614; and L15,029 obtained from Prof. H. E. Rhoades of the University of Illinois, and number 67 obtained from Dr. H. G. Gilman of Cornell University (originally obtained from Dr. W. N. Plastridge of the University of Connecticut). Cultures were maintained in the laboratory on thiol broth (Difco) and transferred every four days. All transfers were incubated at 37 C. in an anaerobic jar containing 10-20% carbon dioxide.

The following antibiotics** were used: penicillin, streptomycin, aureomycin, bacitracin, terramycin, neomycin, and chloromycetin®. Dilutions of the various antibiotics were freshly prepared in most cases, or were kept for short periods at —5 C. prior to use.

The efficiency of penicillin, streptomycin, aureomycin, chloromycetin, neomycin, and terramycin was checked by a tube dilution method. Distilled water was used in making all dilutions. The initial concentration of antibiotic was made in a total of 8 ml. of water. Serial dilutions were made by transferring 4 ml. to each succeeding tube through a total of eleven tubes. One-half ml. of each dilution was then added to 3 ml. of thiol broth. Controls were prepared by adding 0.5 ml. of sterile distilled water to 3 ml. of thiol broth.

All tubes were inoculated with one drop of a 72-hour thiol broth culture of the organism. Inoculated tubes were incubated at 37 C. under 10-20% carbon dioxide for 72 hours. Visible growth in the top third of the tube was considered a positive reaction. The end point of each titration was considered as the first tube of the series showing visible growth.

The efficiency of aureomycin, bacitracin, and terramycin was examined by a plate dilution method. Dilutions of antibiotic were made as described above. One ml. of each dilution was placed in a sterile Petri dish. Fifteen ml. of sterile tryptose agar (bacto-tryptose agar with 0.5 mg./% thiamin) was added to each plate. One loopful of a 72-hour thiol broth culture of *V. fetus* was then streaked on the plate. Plates were incubated under 10-20% CO_2 for 72 hours and examined for visible growth. The end point was considered as the first plate showing growth of *V. fetus*.

Results

The results are recorded in tables 1 and 2. Some variation was noted among the responses of the different organisms, particularly to penicillin and streptomycin. Strain 67 showed an inhibition end point of 0.6 units/ml. for penicillin and 0.3 for streptomycin, as compared with 20.7 units/ml. and 39 units/ml. for penicillin and 19.5 units/ml. and 78 units/ml. for streptomycin against the other two

TABLE 1. Activity of Six Antibiotics Against Three Strains of *Vibrio fetus* by a Tube Dilution Method (units/ml.)

Antibiotic	Strain of *V. fetus* 67	14,847	13,614
Penicillin	0.6*	20.7	39.0
Streptomycin	0.3	19.5	78.0
Aureomycin	5.5	16.6	70.4
Chloromycetin®	0.2	0.8	0.2
Neomycin	>0.4	3.9	70.4
Terramycin	0.1	1.1	0.2

*First dilution showing growth (average of two tests).

†Published with approval of the Director, Wyoming Agricultural Experiment Station, as Journal Paper No. 1.

*Department of Veterinary Science and Bacteriology, Agricultural Experiment Station, University of Wyoming, Laramie.

**The following companies gave liberal supplies of antibiotics used in the study: Chas. Pfizer & Co., Inc., (terramycin); Lederle Laboratories Division, American Cyanamid Company, (aureomycin); Parke, Davis & Co., (chloromycetin); and Commercial Solvents Corp., (bacitracin and neomycin).

strains in the tube dilution method. Chloromycetin, neomycin, and terramycin showed an approximately equal activity against the organisms. These antibiotics varied from 0.2 to 3.9 units/ml. in end-points of inhibition.

The inhibition titer of aureomycin was from 0.4 to 16.6 units/ml., while bacitracin varied from 16.6 to 100 units/ml. in the plate method.

TABLE 2. Activity of Three Antibiotics Against Four Strains of *Vibrio fetus* by a Plate Dilution Method (units/ml.)

Antibiotic	Strain of *V. fetus* L14,847	L13,614	67	15,029
Aureomycin	1.0	2.0	2.0	2.0
Bacitracin	16.6	100	16.6	100
Terramycin	0.5	0.5	0.5	0.25

In order to completely evaluate the chemotherapy of vibriosis it will be necessary to run extensive, controlled *in vivo* studies. Because of the variability of results from experimental infection, there is no adequate method for conducting such trials. It will be necessary to establish a reliable method for routinely producing infection in some experimental animal before the real value of therapy can be established.

Summary

Preliminary studies on the *in vitro* sensitivity of four strains of *Vibrio fetus* to seven antibiotics were made. Aureomycin, penicillin, streptomycin, neomycin, bacitracin, chloromycetin, and terramycin were used. Terramycin, neomycin, and chloromycetin were more active against the organisms than were the other antibiotics used. Both tube dilution and plate dilution methods were employed.

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The use of DDT residual sprays in highly malarious counties during the extended malaria eradication programs of the past eight years, has been shown to have effectively controlled mosquito vectors. Communicable Disease Center, Atlanta, Ga., under whose supervision the campaign is carried out, reports a reduction in the malaria incidence in the population of the treated regions from approximately 63,000 persons in 1945 to 2,227, the number of cases reported last year.

Vehicle for Penicillin in the Treatment of Mastitis

It has been suggested that normal milk, which may be said to be a natural oil emulsion, be employed as a vehicle for penicillin for udder infusion in the treatment of mastitis. Garrison and Turner of Missouri demonstrated that the reinjection of homologous milk from a quarter was followed by inflammatory response. Since milk is approximately 90% water, it is believed that its potential as a retention vehicle would approximate saline. Although milk may appear grossly normal, it may be heavily seeded with bacteria, thus constituting an additional hazard in the use of milk as a vehicle for penicillin.

One theory explaining the prolonged retention of oily vehicles is that the oil particles being immiscible and lighter than the water matrix, are floated and thus dispersed more widely throughout the mammary gland than an aqueous solution. A water solution is soluble in milk and may be withdrawn rapidly. The greater therapeutic effect achieved with penicillin incorporated in the water phase of a water-in-oil emulsion is attributed to the gradual release of the antibiotic over a longer period of time and over a greater surface area; it actually is dispersed more widely. This latter fact has been demonstrated experimentally in a few cases by Stults and Foley, in which trypan blue dye was added to the water-in-oil vehicle. On sectioning a few udders which had been injected 36 hours prior to slaughter with an oil vehicle containing the dye, dispersion to the periphery was observed on cut section. Diffusion via the interstices of the cells of the alveolus possibly may occur, which would also explain results observed on the concentration of penicillin in milk drawn from treated quarters for periods up to five days after treatment. —*Joseph Simon, D.V.M.*

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"Looking more widely at the position and the progress of effective medical knowledge as a whole today, I see no sign that the rate of its advancement is becoming slower, that it is yet approaching anything like a climax or the crest of a wave. Everything seems, on the contrary, to point to its continuing, even with an increasing acceleration, into any tomorrow that we can foresee."—*Sir Henry Dale* in *British Medical Journal*, July 7, 1951.

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A wound on a teat of a lactating cow may result in a lost quarter if not properly treated. —*William F. Riley, D.V.M.*

Procedures For Conducting The Agglutination Test For Detection Of Salmonella Carriers In Turkey Flocks*

ETHEL McNEIL,† Ph.D., and WILLIAM R. HINSHAW,†† D.V.M., Ph.D.

SALMONELLOSIS continues to be one of the important causes of turkey poult mortality in the major turkey growing areas. At least 50 types have been reported from turkeys by Edwards, Bruner and Moran,[1] and Hinshaw and McNeil[2]. Of these, certain types such as *Salmonella typhimurium, Sal. newport,* and *Sal. oranienburg* appear to be especially pathogenic, and to be transmitted through the egg; either by ovarian infection or contamination of the shell by feces, or both. Hinshaw and McNeil[2] found that *Sal. typhimurium* accounted for approximately 50% of the outbreak in turkeys investigated by them.

Because of its increasing importance, certain groups are initiating testing programs in an attempt to eliminate the infection. The agglutination test has been used successfully by the writers in detecting *Sal. typhimurium* carriers. They have, however, emphasized that there are many pitfalls in such a program, but that under certain conditions, it can be used to advantage. The principal difficulties occur in making antigen, and in interpretation of results. The purpose of this paper is to review the technics used and to point out some of the precautions that should be considered in planning a testing program.

Selection of Cultures

The use, during the past two decades, of the agglutination test for detecting pullorum disease carriers has demonstrated the fact that one must carefully select the strains of cultures to be used in making antigen. The cultures must be smooth, must grow readily, and above all, must contain the full quota of antigenic components. *Sal. pullorum,* for example, is a non-motile Salmonella containing only somatic antigens (IX, $XII_{1,2,3}$). It should be self-evident, therefore, that when one attempts to use the test for more complex Salmonella types having both somatic and flagellar antigens, the problem becomes greater than testing for pullorum disease. Since *Sal. typhimurium* has caused greater losses in turkey poults than other types, a program of detecting carriers of this type was conducted by the authors in California over a period of several years. Like most of the Salmonellas, this type is motile, and its antigenic formula is I, IV, V, XII (0 or somatic antigens) and i; 1,2,3 (H or flagellar antigens).

Anyone attempting to carry out a testing program must familiarize himself with the Kauffman-White Schema (Kauffman[4]), which is the serological structural formula of the group. There are now somatic antigens designated from I to XXXIX and combinations of flagellar antigens from 1 to 7 and a to z. A knowledge of these antigenic formulas is an essential, but only one of several steps to be considered in a testing program. When preparing antigens one must have specific antiserums and must check several cultures of each type before each testing season to be sure that all antigenic components are present. He must also be sure that the culture is smooth as indicated by its failure to agglutinate in 1:500 acriflavine (Hinshaw and McNeil[2]). Several colonies of each culture should be checked to make sure that it produces predominantly smooth colonies.

Both O and H Antigens Needed

O Antigens. The next step is to be sure to make the O and H antigens, separately. The O antigens should be prepared from non-motile strains. A list of such available non-motile strains is given by Kauffmann[4]. They should be seeded on beef heart infusion agar in Kolle or similar flasks. The writers have had good results with the use of dehydrated beef heart infusion (Baltimore Biological Laboratories 128 or Difco Products). At the end of 24

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*The information presented in this paper is based on research on salmonellosis conducted by the writers at the University of California, Agricultural Experiment Station.

†College of Veterinary Medicine, University of Illinois, Urbana.

††Biological Department, Camp Detrick, Frederick, Md.

hours' incubation, the growth should be washed off with 0.5% phenolized physiological saline. If the cultures have grown well, and if a minimum amount of phenolized saline is used, a stock antigen with a dilution factor of 1:100 or even 1:150 can be obtained. For testing, the concentrated antigen should be diluted with 0.25% phenolized saline to a turbidity of McFarland tube 1 or Gates 6.0. The pH should be adjusted to 7.8 to 8.0. Only enough for one or two days' use should be diluted at a time, and should be refrigerated when not in use. A 1:25 dilution tube test is recommended and it should be incubated for 24 hours at 50 C, either in a water bath or in a dry air incubator with a high relative humidity.

H Antigens. The H antigens must be prepared in two parts (phase 1 and phase 2). For example, the first step in preparing phase 1 of *Sal. typhimurium* (component "i") is to insure a good motile strain by several serial passages through semi-solid agar. The next step is to suppress phase 2. The writers have found the following method most applicable:

1. Prepare 0.3% infusion agar plates.
2. Near the edge of the plate place a large drop of phase 2 antiserum.
3. Inoculate the culture directly into this drop, and incubate overnight in an upright position.
4. If the culture has grown across the plate, remove a loopful from a point as far as possible removed from the original inoculation.
5. Place this loopful of culture in broth and incubate for 12 to 18 hours at 37 C.

By this procedure, phase 2 of the culture unites with its specific antiserum and is held at the point of inoculation, thus permitting organisms containing phase 1 component to migrate across the plate. The broth culture should be rechecked with phase 1 antiserum to insure satisfactory suppression. If satisfactory, transplants are made into other tubes of beef heart infusion broth. Kolle flasks are then seeded by flooding the agar with 20 to 30 cc. of the broth culture and these are incubated for 24 hours. The stock antigen is obtained by washing off the growth with a small amount of formalized saline. A final dilution of 0.6% formalin should be made. If short, sterile glass rods are inserted in the flasks, and the flasks gently tilted back and forth, the growth can easily be removed without cutting the agar surface. The dilution factor of the concentrated antigen should be 1:75 to 1:100. The flagellar antigens should be diluted just before use with 0.3% formolized saline and adjusted to a turbidity of McFarland tube 1 or Gates 6.0 and a pH 7.8 to 8.0.

This procedure is repeated for phase 2 by suppression of phase 1. If monophasic variants are available, the suppression steps are, of course, unnecessary. A list of such monophasic variants is given by Kauffman[4]. The two phases should be stored separately and combined just before use. The H phase of the test also is set up at a 1:25 dilution and incubated for four hours at 50 C. Both O and H tests should have controls set up with specific serums on each day of testing. The O tests will have one control tube, and the H tests 2 controls (phase 1 and phase 2). Negative serum controls are also essential.

Discussion and Summary

Non-motile strains have been found in only B, C and D groups of the Kauffman-White Schema. It has not been possible to make satisfactory O antigens from representatives of group E (*i.e. Sal. anatum*), group F (*e.i. Sal. senftenberg*) or "further groups" (*i.e. Sal. kentucky*). Using such procedures as are available at present, the O antigens made from members of these groups have proved too sensitive for accurate results. If used, agglutination occurs in a large percentage of the tubes, even with known negative sera.

A great many precautions are necessary in interpretation of results. As in the case of pullorum disease, it is necessary to have a complete history of the flocks being tested, and a willingness to use such a history. It is seldom that a single bird possesses antibodies for all of the antigenic components. Some will react to the O antigen, and some to the H, and some to parts of both O and H antigens. The sera showing H reactions should be set in dilution with phase 1 and phase 2 separately. If a flock contains birds whose sera react in high titer to the O antigen, and to H phase 1, and if the history is indicative, the laboratorian can be reasonably sure that infection exists in the flock.

It is obvious that cross reactions can occur due to possession of common antigenic components by more than one Salmonella type, as for example the XII component of *Sal. pullorum* and *Sal. typhimurium* (Hinshaw and McNeil[5]). There are many cross reactions possible in phase 2 of the flagellar antigens, and caution should be used if only phase 2 flagellar reactions occur in a flock.

Other organisms which may cause non-specific reactions include the coliform types which possess Salmonella components IV,

V, XII, 1, 2, 3, 4, and 5. There is a poorly understood reaction between antibodies built up against *Sal. anatum* and *Sal. pullorum* antigen. Certain cocci also possess Salmonella antigens. These are specific illustrations of the importance of the use of histories of flocks, and of the need for autopsy and complete bacteriological examination of questionable birds.

Since most of the Salmonellas occur in more than one host, a testing program alone can usually not eliminate infection from a community. It should be accompanied by a survey of other animals, including man, on the farm. Growers should be urged to submit poults from each hatch for a complete laboratory examination. This serves as a constant check on the testing program. Birds for replacement flocks should come from eggs free from infection and hatched in incubators which accept only eggs of like status.

Summary

In summary, it should be emphasized that one cannot conduct a successful paratyphoid testing program simply by condemning all birds whose sera produce a reaction in the test tubes. The primary object of the test should be to diagnose accurately the disease in the flock, and to select the maximum number of infected birds. To do this one must: (1) carefully interpret the reactions by a consideration of the Kauffmann-White Schema; (2) consider the history of the flock; (3) autopsy a reasonable number of birds in questionable cases; (4) promptly remove the reactors; (5) practice a sound cleaning and disinfecting program (6) retest until no reactors are found; (7) eliminate the disease in other carriers, including man.

When conducting the test, it is necessary to use both an O (somatic) and H (flagellar) antigen on each sample at a 1:25 dilution. The O test must be incubated for 24 hours at 50 C; the H test for four hours at 50 C. Great care must be used in preparation of antigens in order that: (1) they contain all antigenic components, and (2) they are not too sensitive for accurate results.

Due to the ubiquitous nature of the paratyphoid infections, it is more difficult to carry out a successful paratyphoid eradication program than a pullorum disease eradication program. The test can be used to good advantage to detect infected flocks. The decision whether to retest or to sell the infected flock then depends on the value of the birds as breeders.

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SHIPPING FEVER
HOW IT ACTS-
Watch for animals that are listless, go off feed.
Cough, nasal discharge, loss of weight are symptoms.
Fatal pneumonia often develops.
Can spread fast to home herd if new animals aren't isolated.
PREVENT LOSSES
BEST WAY TO PREVENT SHIPPING FEVER LOSSES IS TO FOLLOW GUIDANCE OF YOUR LOCAL VETERINARIAN.
WHAT TO DO-
Prevent fatigue, exposure of shipped-in cattle.
Isolate new arrivals from home herd.
Have veterinarian diagnose promptly if sickness appears.
Protective serum is advisable for sick or exposed animals.
Prepared by American Foundation for Animal Health

Reproduced above is another in the series of features Know Your Livestock Problems appearing in a large number of farm newspapers and magazines.

A New Preparation For The Treatment Of Canine Dermatoses

W. V. PETTY, B.S., D.V.M., Atlanta, Georgia

SINCE the beginning of the practice of veterinary medicine, control of various dermatoses, including mange in dogs, has presented veterinarians with a major problem. Treatment too often ends in failure.

Many times failure is due to improper or incomplete diagnosis, or to a lack of attention to such accompanying ills as malnutrition and internal parasitism. Many failures are due to the fact that most of the known remedies are too toxic to use in concentrations necessary to destroy the invading fungi or mites. In some cases, owners allow their animals to be hospitalized only until improvement is noted. Discontinuation of treatment at home because the medicant used has an offending odor, or is greasy and otherwise objectionable, is a common observation.

An emulsion containing alkenyl-dimethyl-benzyl-ammonium chloride, terpene thiocyano-acetate esters and polyethylene oxide esters has been compounded and given the trade name fungasarc®. This preparation shows promise of overcoming many of the disagreeable features of products now used, while effecting satisfactory recoveries in many common skin conditions.

The emulsion is distributed in a concentrated form, which is diluted 1:3 with water before use. In recommended dilution it has powerful insecticidal, deodorant and fungicidal properties. Being an aqueous product it is neither greasy nor oily, and will not stain nor otherwise mar furniture, clothes or upholstery.

The writer, who owns and operates a small animal hospital, has used fungasarc exclusively on all skin conditions of external origin since November 1949, and results have far surpassed expectations. After eight years of using various and sundry other treatments, this product was a welcome newcomer.

When an animal is presented for treatment of a skin condition, scrapings and other tests are made to determine the cause of the trouble, but fungasarc is used regardless of the findings, with better all-round results than heretofore thought possible.

In a minority of cases, where no external cause for dermatitis can be demonstrated, certain internal medication is used in conjunction with daily local applications of this new agent. End results are almost always favorable. In all cases the animal is checked and treated (when necessary) for internal parasites. Sometimes the internal medication consists of alkalinizing doses of magnesium hydroxide. In other cases, parenteral injections of placental extracts are used. In still others, arsenicals, as alteratives, are given, and not infrequently circumstances appear to warrant a combination of these therapeutic agents.

The germicidal properties of fungasarc make it an excellent product with which to control local infections on the skin.

Findings in the writer's hospital show the product to be a powerful insecticide. It not only rapidly destroys fleas and lice, but nits as well. Though no claims are made by the manufacturer at the present time for its action against ticks, the writer has observed that all stages of the common dog tick, *Rhipicephalus sanguineus*, are susceptible and that thorough application serves as an excellent repellent.

Toxicological studies on fungasarc and on its ingredients were made by Dr. Herman A. Shelanski, Industrial Toxicology Laboratories, Philadelphia, Pa., which studies indicate non-toxicity in recommended dilutions. One feeding test (25 cc. of concentrated product per kg. of body weight, given orally) failed to produce toxic symptoms in dogs. Animals to which this amount was administered by stomach tube showed slight convulsions of very short duration, but at autopsy no ill effects nor chronic injuries were noted.

Summary

1. A compound of alkenyl-dimethyl-benzyl-ammonium chloride, terpene thiocyano-acetate esters and polyethylene oxide esters (fungasarc) has given useful service and has proved beneficial in the treatment of many skin anomalies of dogs; including external parasites.

2. The compound is a powerful insecticide, fungicide and bactericide. Experience to date

(*Continued on page* 376)

®Patent applied for, Osco Chemical Co., Atlanta, Ga.

EDITORIAL COMMENTS

Hell and High Water

Radio, television, newspapers, and magazines have by now carried the story of the holocaust following the disastrous flood in the Midwest. The loss is estimated to be the greatest ever suffered by any previously flooded region.

Kansas City's industrial areas lying on either side of the Kaw River (Kansas and Missouri) were devastated. Not all the loss has been counted. The list of buildings in the inundated areas suffering structural damage continues to lengthen. To borrow an analogy from the famous book by Margaret Mitchell, much on farms, in towns and cities of the Kaw River watershed has "gone with the flood."

The offices of VETERINARY MEDICINE, located on the 8th floor of the Livestock Exchange Building, were hurriedly evacuated on Friday, July 13. All personnel were removed before the crest of water covered the building area, which occurred in a matter of less than one hour. Waters reached over the second floor of the building, making access to records impossible for two weeks. Delays have been unavoidable. Offers of space to serve as temporary quarters were freely given, as well as other offers to be of service. This theme of helpfulness prevailed throughout the regions adjacent to the flood-damaged area. It made possible performance of some essential duties which could not otherwise have been accomplished.

The editors also appreciate the indulgence of all correspondents during that period when lack of permanent facilities of our office prevented normal operations.

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A long convalescent period can be expected following canine leptospirosis infection.—*C. E. DeCamp, D.V.M.*

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Turkey production is big business now. From a setting or two of eggs for a few Thanksgiving birds, cared for by the farm wife, growing turkeys for meat now occupies an important position in our agricultural economy.

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It is routine in our practice to administer, dispense or prescribe riboflavin and vitamin A as supplementary treatment in all disorders involving the eyes of pet animals.—*H. E. Jensen, D.V.M.*

More Meat Animals than a Year Ago

Calling attention to the fact that there are 9,415,000 more meat animals on the farms and ranches of the United States than a year ago, the National Live Stock and Meat Board asserts that this increase augurs well for the increased meat supplies so necessary for the needs of a rapidly expanding human population.

This increased meat animal population includes 4,127,000 more cattle, 84% of which are beef cattle, 4,526,000 more hogs and 762,000 more sheep and lambs than on January 1, 1950.

The Board points out that there is an average of 28 cattle, 22 hogs, and 10 sheep and lambs per square mile in this country. On a state-wide basis, however, there is a wide range in density of animal population.

Iowa, for example, leads every state in density of beef cattle population with an average of 61 per square mile. Nebraska is second with 44, Kansas third with 36, Illinois fourth with 30, and Missouri has an average of 27 beef cattle per square mile.

The state of Ohio with 27 sheep and lambs per square mile leads all states in density of sheep population. Texas ranks second with an average of 26.6 sheep and lambs per square mile, and Wyoming is third with 19.7. Kentucky with 18.5 and Iowa with an average of 18 sheep and lambs per square mile, are in fourth and fifth places.

Calling attention to the density of hog numbers among the different states, the Board reports that the five states of Iowa, Indiana, Illinois, Ohio and Missouri, which together have more than half of the nation's total hog population, are the five leading states in density of hog numbers.

Taken together as a group, these five states have an average of 129 hogs per square mile. The respective averages for each of these states are as follows: Iowa 235, Indiana 136, Illinois 124, Ohio 83 and Missouri 70 hogs per square mile.

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Streptomycin production in the United States was over 190,000 lb. in 1950.

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Cooperation is not a sentiment; it is an economic necessity.

Livestock Production in the United States

According to the USDA, the numbers of cattle and swine on farms and ranches in the United States January 1, 1951 were: cattle, 84,179,000; swine, 65,028,000. These figures show an increase over the numbers January 1, 1950 of 4,100,000 cattle and 4,500,000 hogs. Sheep also registered a gain of 762,000 over the number reported a year earlier.

Cash sales of cattle, swine and sheep during 1950 totaled $9,402,000,000. and equalled one-third of the total farm income last year.

The production of meat amounted to 22,236,000,000 lb.—144.5 lb. per capita. A production of 23,350,000,000 lb. is forecast for this year. The per capita consumption this year is expected to average 148 lb.

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Lapinized Hog Cholera Vaccine

Research and development of lapinized vaccine had its basic and practical beginnings during World War II, when scientists of the Grosse Isle project developed a rinderpest vaccine by the methods of foreign tissue adaptation.

Current farm paper discussions of lapinized hog cholera vaccine appear to be initial announcements and have created considerable interest. Actually the practical value of this vaccine was discussed by Dr. J. A. Baker, at present Director, Cornell Research Laboratory, Ithaca, N. Y., at the 1947 annual convention of the A.V.M.A. held in Cincinnati, Ohio. Since that time, work in perfection of the products, field testing, and production in quantity have continued.

It has been announced that Doctor Baker will present at the coming meeting in Milwaukee, the latest information on the advancement made since his preliminary report.

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Twenty-five years ago there was no specific treatment for pneumonia. Then the serum treatment was developed and the annual death rate fell from 85 to 68 per 100,000 population—a remarkable reduction. Fifteen years ago the sulfa treatment was developed and the mortality fell to 58 per 100,000. When in 1944 the use of penicillin became general, the rate fell to 36, and in 1950 it was only 26 per 100,000 population. Applied to the entire population, these figures spell saving the lives of 91,000 persons each year who would die of pneumonia if the therapy of 1925 still prevailed.

Recommendations of the Midwestern-North Central Regional Rabies Conference, Omaha, Nebraska, May 21-22, 1951

WHEREAS, rabies has become established and appears to be spreading through the upper Mississippi and Missouri valleys and so constitutes a serious threat to human health, agricultural economy and wildlife resources of this area, representatives of the affected states and personnel of responsible federal agencies met at Omaha, Neb., on May 21-22, 1951, and in closing agreed as follows:

1. That each of the affected states inaugurate coordinated programs for the control of rabies; that each state's program can most effectively be carried out through the creation of a committee composed of representatives from those agencies at the state level responsible for public health, livestock disease control and wildlife conservation.

2. That each state arrange for adequate diagnostic facilities and that reports of rabies cases in animals be collected by an appropriate state agency and that the state health officer include these data in the weekly telegraphic reports to the U. S. Public Health Service.

3. That the epizootiology of rabies in wildlife is inadequately understood and urge that investigation of this subject be made to provide information necessary for the intelligent and effective control of this disease.

4. That technical assistance and guidance is available from the U. S. Public Health Service of the Federal Security Agency, the Fish and Wildlife Service of the Department of Interior, and the Bureau of Animal Industry of the U. S. Department of Agriculture.

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Ether-Killed *Brucella abortus* Vaccine

Experimental vaccination of calves and cows during an outbreak of brucellosis in a herd of dairy cows belonging to the University of Pennsylvania, indicates that ether-killed *Brucella abortus* vaccine, combined with adjuvants, stimulated serum agglutination response for periods appreciably longer than those resulting from vaccination with strain 19.

Live and Danks also report (*Am. Jour. Vet. Res.*, 12:175, 1951) that a booster injection of this new vaccine six months after the original vaccination, "was followed by a marked rise in agglutinin production."

Dean Claude S. Bryan Succumbs to Anemia

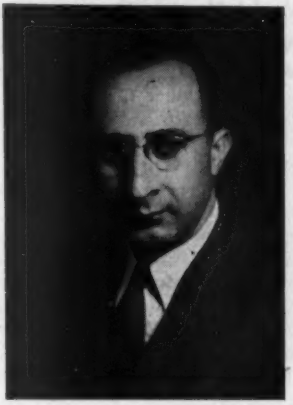
Dr. Claude S. Bryan, 43, dean of the School of Veterinary Medicine at Michigan State College, died early Monday morning, July 30, 1951, at the University of Michigan hospital, Ann Arbor. Cause of death was aplastic anemia. He had been hospitalized since July 13.

Dean Bryan had been a member of the faculty for more than 20 years, and had earned three of his advanced degrees there. Over the years, he had made a fine record as a research scientist and teacher, and had won professional recognition throughout the United States. He first joined the Michigan State staff in 1930 as a graduate assistant in bacteriology.

Born June 5, 1908, in Bedminster, Pa., Doctor Bryan received his B.S. degree from Pennsylvania State College in 1930. He received his M.S., Ph.D., and D.V.M. degrees from Michigan State College in 1932, 1937, and 1942, respectively.

In 1947, Doctor Bryan became dean of the School of Veterinary Medicine, succeeding the late Dr. Ward Giltner upon the latter's retirement. Dean Bryan continued the work of Doctor Giltner in building the school into one of the finest in the nation. He put much effort into the work which culminated in the construction of Giltner Hall, the college's new veterinary medical center, now nearing completion.

The widely known educator and scientist was an authority on bovine mastitis and dairy hygiene, and had written more than 100 jour-



Dr. C. S. Bryan

nal articles in those fields, in addition to numerous bulletins. He had contributed generously to the pages of VETERINARY MEDICINE.

His greatest service to Michigan State College was performed in the postwar years when, as Dean of Veterinary Medicine, he maintained the integrity and morale of his faculty despite great difficulties. His optimistic nature enabled him to persuade others to look ahead, as he was doing, to the day when there would be physical facilities worthy of the distinguished scientists who were his associates. His untimely death is all the more to be regretted because he will not see put into use the fine new building being constructed to house the School of Veterinary Medicine, including the Department of Bacteriology, in which he worked and taught for so many years. The building is officially a memorial to Dean Ward Giltner, his predecessor, but it will be a memorial to Dean Bryan, too, for into its planning he put time, thought, and energy without stint.

He was a member of the East Lansing chapter of Kiwanis and was on the board of elders of the Peoples Church, East Lansing. He is survived by his wife, Jean Lenore, and two daughters, Marjorie Ann and Nelda Jane.

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It must be kept in mind that there are yet isolated cases of tuberculosis in cattle. Recently, results of tests in area work condemned an entire herd.—*R. E. Libby, D.V.M.*

School of Veterinary Medicine, University of Georgia, Athens

Views on the opposite page have been selected from a large group to illustrate the facilities now in use at the Georgia school. These, provided by Dean Tom J. Jones, suggest the completeness of equipment and attractiveness of the new building housing all elements of the School of Veterinary Medicine.

← Opposite page

1. View of the large animal clinic amphitheater. Operating table is hydraulic-operated. Suspended surgical light is adjustable.
2. Horse and cattle stalls located in the large animal wing of the new veterinary building.
3. Reception area for client-owners of small animal patients. Design and utility are combined throughout the building, which is equipped to render the best possible service.
4. View of a small animal ward. Cages for dogs are constructed of stainless steel; partitions of plate glass. Note that cage doors are lifted to open, giving free access to the compartment without obstructing passageways.
5. Corner of the small animal surgery. The care with which facilities have been designed is apparent also in this view.

PUBLIC HEALTH

JAMES H. STEELE, D.V.M., M.P.H.
Atlanta, Georgia

World Health Organization

The World Health Organization invited a group of veterinary medical consultants to Geneva last December to discuss animal diseases of public health significance. The meeting was held jointly as a Food Agriculture Organization/World Health Organization (FAO/WHO) Expert Group on Zoonoses. There were representatives from the United States, Argentina, Brazil, United Kingdom, Sweden, Denmark, France, Yugoslavia, Israeli, Italy, and Java. There were observers present from a number of other countries and agencies.

The report of this group will be published in the near future. It was recently approved by the Executive Board of the World Health Organization. In approving it, the Board called attention to the appreciable contributions to public health and national economy which can be effected by practical measures against bovine tuberculosis, hydatidosis and anthrax. The Board emphasized the importance of giving special attention, through national administrations, to diseases of animals transmissible to man and to the inspection and hygiene of foods of animal origin.

The Veterinary Public Health Activities of the Pan-American Sanitary Bureau and the World Health Organization are making valuable contributions to the advancement of public health in many parts of the world and to the maintenance of free democratic governments. There is no one in the public health profession who is in such an enviable position as the veterinarian. He can contribute both to better health and to better nutrition, which are the keystones of health throughout the world.

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Suppurative Ringworm Contracted From Cattle

Public health and medical literature seldom carries reports of outbreaks of ringworm in man which were contracted from cattle. A report, published by Fowle and Georg in *Archives of Dermatology and Syphilology*, 56:780 (Dec.), 1947, presents a very interesting animal fungus disease problem which has considerable public health significance. The authors describe 23 cases of deep suppurative ringworm infection contracted from cattle. Descriptions of lesions, treatment and clinical course of the infections are given in detail. Examination of the clinical material and cultural studies indicated that 14 cases of the infection were caused by faviform trichophyta, 12 cases by *Trichophyton discoides* and two cases by *Trichophyton album*. Cultures in four other cases yielded the common gypseum type of Trichophyton, *Trichophyton mentagrophytes*. In the remaining five cases in this series, pathogenic fungi were not observed on hairs nor could they be grown in cultures. However, the nature of the lesions, the absence of bacterial infection and the history of contact with cattle infected with ringworm indicated that these were also of ringworm contracted from cattle. To confirm these cases by animal tests, typical ringworm lesions were obtained in rabbits from inoculations with cultures of *T. album* and *T. discoides* from patients in this series, and pure cultures of the organisms were recovered.

There is no doubt that there are a number of outbreaks of infection of this type occurring in the United States that are not brought to the attention of public health authorities. The difficulty of working up the diagnosis of these diseases is such that there are few reference centers outside of our major cities that can assist with this work. It is important for veterinarians to remember that these infections are communicable to man from animals and, when they are treating herds or individual animals, they should caution the owners about the danger.

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Typhoid Fever

Two cases of typhoid fever in Oregon were traced to raw milk from a one-cow dairy where both the proprietor and his wife were found to be typhoid fever carriers.

Twenty years ago reports of this type were quite common, but today they are almost public health history. Through improved milk sanitation, and the good efforts of our colleagues in public health, and milk sanitarians, this problem has almost disappeared. It is interesting to note that milk sanitation must include more than the health of the animal and general sanitation. Occasionally we must consider the health of man by which wholesome food can also become contaminated.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Antibiotics for Growth Stimulation

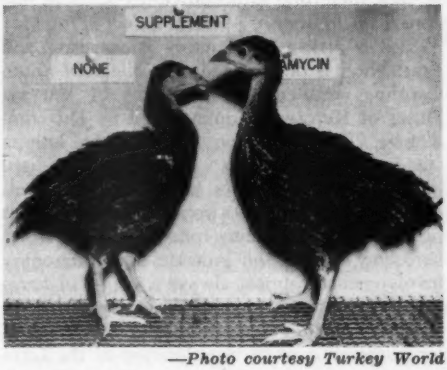
Dr. James McGinnis, Washington State College, (*Turkey World*, 26:16 [May], 1951) in an article entitled, What Can You Expect from Antibiotics, has attempted to answer some of the questions on the value of these drugs for promoting growth in turkeys. Essentially the same information applies to chickens. He emphasizes that antibiotic effect must not be confused with vitamin B_{12} effect and refers to the adoption by the 1950 Feed Control Officials' Conference of the name, Antibiotic Feed Supplement, for all feed preparations containing growth promoting antibiotics. The definition of an antibiotic feed supplement includes a stipulation that such a product must contain at least 1 gm. of a stated growth-promoting antibiotic or antibiotics per pound of supplement.

A new name, Vitamin B_{12} Feed Supplement, was also adopted at the same meeting, and the requirements for this vitamin in such a supplement is that each pound of the product must contain at least 1.5 mg. of vitamin B_{12} per pound. These two newly adopted names supersede the term Animal Protein Factor (APF) which has always been a confusing designation since to many people the name meant something which could be used in place of an animal protein concentrate.

The value of antibiotics as growth-promoting factors has only been known for a little over a year, but their use has become universal as supplements for feeds for young turkeys, as well as for young chickens, and pigs. In turkeys, these agents are particularly effective for the first eight weeks. After that, according to McGinnis, there is little effect, and from data available at present, the ultimate size of animals will not be increased by their use.

McGinnis states the use of antibiotics has greatly reduced poult mortality and increased the uniformity of flocks. Evidence obtained by researches in this field also indicates that it may be possible to lower the recommended protein level of 28% for young turkeys to as little as 24%. No improvement in hatchability of eggs has been noted by feeding of antibiotics to healthy chickens or to turkey breeders.

The mechanism of action as growth promoters is not yet known. No doubt, improvement of health due to prevention of certain diseases of young animals is a contributing factor, but this is not the only explanation. There is a great need for fundamental studies to determine this mechanism. Such studies



—Photo courtesy Turkey World

These turkeys were fed a diet containing 10% fish meal. The one at right is from a group receiving supplemental terramycin. At four weeks those fed terramycin averaged 625 gm., no antibiotic supplement, 528 gm.

should include experiments to answer the question of the possible harmful effect that antibiotics might have on the normal microbial flora of the digestive tract. It is conceivable that such an effect might result in the establishment of a different and harmful flora, which, in turn, would make the animal susceptible to diseases not affected by the antibiotic being used. The possibility of development of large populations of resistant, pathogenic microflora should also be remembered.

Veterinarians who have contact with farmers using such supplement feeds for animals of any species should be alert to such possibilities in case losses occur. Thorough investigations should be made to eliminate all other causes first, but antibiotics should not be forgotten in obtaining case histories because of the widespread use of these supplements in feeds. Furthermore, when antibiotics are being considered for use in a sick herd or flock, the history of their use in feeds is essential. The particular agent used in the feed should be determined and consideration should be given to use of other correlated ones that are equally effective for the disease diagnosed to avoid the problem of treatment to control organisms resistant to the antibiotic fed.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

The hydrocarbon kerosene, is frequently administered by laymen as a "household" remedy in the treatment of rumen bloat in cattle. It was therefore informative to read in the *American Journal of Medical Sciences* for May 1951, an article by Doctors Richardson and Pratt-Thomas of the Medical College of South Carolina, entitled, Toxic Effects of Varying Doses of Kerosene Administered by Different Routes. The discussion is from the human standpoint, but as dogs and rabbits were used in the project, it carries high interest for veterinarians. The authors contend that autopsies performed on children following death from kerosene intoxication indicate that pulmonary involvement is almost always a sequel of kerosene ingestion. The project sought to determine whether the lung involvement is the effect of lung aspiration or of regurgitation of the kerosene, and therefore it was experimentally administered by intragastric, intravenous and intratracheal routes. One tentative conclusion is that "provided aspiration does not occur, a volume in excess of a pint would have to be swallowed in order to prove fatal" to a child weighing 50 pounds. A general conclusion is that, "consideration of dosage and degree of lung damage clearly show that aspiration is the most serious and usual feature of kerosene poisoning as it occurs clinically."

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Recently a question came to us regarding the advisability or inadvisability of lancing the edematous substernal infiltrations frequently observed in horses affected with "swamp fever." Our advice in general is against this unless the edema is so severe as to threaten local death, by pressure, of neighboring tissues. In the latter event resort to limited scarification is sometimes necessary. Our position against the draining of these swellings is based on the following: (1) It still further depletes an already weakened patient; (2) The scarification wounds invite infection to complicate the existing viral condition; (3) The draining material, as do most of the fluids of the body, contains the etiological virus and thus additionally contaminates the surroundings. The use of diuretics and cardiovascular stimulants, with exercise if the animal is capable of this, is a preferred method of handling.

A question recently submitted asked: In an outbreak of porcine atrophic rhinitis, what should be the method of handling? The evidence available at this time appears to support the theory that atrophic rhinitis is a contact disease. If this is correct, the first step should be the segregation of the healthy from the diseased, disposal of the latter for slaughter, and placing the former in new, high, dry lots or pastures. The writer has seen a few autopsies of animals that were affected with this condition, and the observed pathological changes in the tissues of the nasal region were so extensive that a return to anything approaching normal is impossible and permanent unthriftiness is to be expected. We are still awaiting with interest the results of quarantine, or slaughter, and the use of one or more of the newer chemotherapeutic and antibiotic agents when applied at the beginning of an outbreak.

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Cortisone, the rare compound so valuable in the treatment of arthritic conditions in man, has up to this time been obtained from animal bile. The compound is so rare because, as reported, it requires the bile from approximately 40 animals to obtain one therapeutic human dose. Cortisone is a modified steroid. Research chemists of the U. S. Eastern Regional Research Laboratory—with plant search aid from the U. S. Bureaus of Plant Industry, Soils, and Agricultural Engineering—have now isolated the unmodified steroid from various plants such as yuccas, yams, agaves and molinas. The U. S. Public Health Service is studying the conversion of these plant steroids into cortisone. This, it is asserted, will be only a minor chemical change. If a plant can be found that will yield enough steroid to make it commercially profitable to grow it, then cortisone may become sufficiently abundant to be available for veterinary use.

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In regard to the use of anesthetics, it is recorded as follows in paragraph 21 of chapter 2, Genesis: "And the Lord caused a deep sleep to fall upon Adam, and he slept; and he took one of his ribs, and closed up the flesh instead thereof;".

CLINICAL REPORTS

Report of Parenteral Use of Bacitracin in Cattle

JOHN G. MARTIN, D.V.M., Boone, North Carolina

This paper reports the use of bacitracin-topical (The Upjohn Company) subcutaneously in the treatment of some bacterial infections of cattle. Some of the cases reported were treated with sulfonamides and penicillin prior to the use of this antibiotic. These suggest the possibility that bacitracin may prove most useful in veterinary practice.

Bacitracin-topical is offered the medical profession as a desiccated sterile powder which may be dissolved by adding sterile saline solution or distilled water. It is intended, primarily for local injection, wet dressings, irrigations and instillation into cavities, etc. The antibiotic is listed as a topical powder, as required by the Food and Drug Administration. To date, bacitracin may not be packaged for parenteral use because some laboratory animals have exhibited nephrotoxic symptoms under experimental studies. In limited practical field experience on large animals and pets, no untoward reactions have been observed.

Case 1. A yearling Hereford was observed having symptoms of profuse watery diarrhea, anorexia, and depression. The temperature was normal. The owner advised that a similar animal had died several days earlier with identical symptoms.

Sulfathiazole was given orally for two days with no apparent improvement. On the third day, 10,000 units bacitracin-topical was given subcutaneously. The owner later reported complete recovery in 24 hours. He noticed no harmful reaction from the drug.

Case 2. An eight-month-old Shorthorn, one of a group of 40 feeder calves, exhibited symptoms of a respiratory involvement. There was considerable congestion of the lungs. The temperature was 105 F. Symptoms of cough, dyspnea and anorexia were noted, and a moderate nasal discharge was present. All other calves in the group exhibited cough and nasal discharges of varying degrees.

Treatment included the use of penicillin intramuscularly, sulfamerazine and sulfathiazole intravenously, and sulfathiazole orally for three days. Seven days later the owner reported that the animal showed some improvement the day following the first visit, but had since refused to eat. The calf was greatly emaciated at the time of second visit and was again showing severe dyspnea. At this visit, the calf was given 10,000 units of bacitracin-topical subcutaneously. The following day case no. 3 was seen on a neighboring farm and while there, case no. 2 was observed. The calf appeared completely recovered in every respect. No apparent evidence of a harmful local or systemic reaction could be observed.

Case 3. As mentioned above, this case was a calf on a neighboring farm to no. 2. The case history, environment, and symptoms were identical.

Treatment consisted of the injection of 10,000 units of bacitracin-topical subcutaneously. No other treatment was required and the owner reported complete recovery in 36 hours. No untoward reaction to the drug was observed.

Cases 4 and 5. These were two one-year-old Hereford heifers that were purchased at a public market and trucked to the farm. Soon after arrival both developed a cough and nasal discharge. Approximately two weeks later both went off feed and the owner called for aid. He stated that each had been given hemorrhagic septicemia serum and sulfathiazole orally. Upon examination it was revealed that each had a temperature between 104 F. and 105 F. A hoarse cough and extreme emaciation were predominating symptoms.

Treatment consisted of 10,000 units of bacitracin-topical administered subcutaneously. Observation 48 hours later showed apparent recovery of both animals with no apparent harmful reaction from the drug. The owner stated that each began to eat again 12 hours after treatment.

Cases 6 and 7. These were two small calves, a one-month-old Holstein and a two-month-old Guernsey, respectively. Case no. 6, the Holstein, was diagnosed as pneumonia of three days' duration. Diarrhea had persisted for one week. As a rule, a case of pneumonia at this stage has been considered a poor survival risk, regardless of treatment used. Case no. 7 was in the initial stages of pneumonia, still strong, and might have been conceded a good chance for recovery. Both calves were off feed. Case no. 6 had a normal temperature, but no. 7 had a temperature of 104 F.

Treatment included 2,000 units of bacitracin-topical subcutaneously, plus 900,000 units of procaine penicillin in oil intramuscularly, to each. Both calves were eating in 12 hours. The Holstein calf made a rapid recovery with no additional treatment, but the Guernsey was

given an additional 2,000 units of bacitracin 48 hours after first treatment. Its recovery was complete in an additional 24 hours. The recovery of these two calves occurred in a reverse manner to that expected at the onset of treatment.

Case 8. A two-year-old Jersey heifer, in late stages of pregnancy, was purchased from a dealer of livestock. About three days after arrival at present owner's farm she developed a profuse, watery diarrhea, anorexia, and a heavy nasal discharge. Upon examination, the temperature and lungs were noted to be normal.

This heifer was given 10,000 units bacitracin-topical subcutaneously. Twenty-four hours later she was examined again and at this time diarrhea had been checked, but the appetite was variable. The treatment of the preceding day was repeated. Later the owner reported that the heifer quickly responded to the second dose and that she gave birth to a live calf the day following the final treatment. No evidence of harmful reaction was visible.

Conclusion

In view of the results obtained in the use of bacitracin-topical subcutaneously in the few cases reported above, it would seem that there is a promising future for the drug in veterinary practice. Further studies in regard to dosage and versatility of usage would certainly be indicated.

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Anuria and Dysuria in the Male Cat

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The conditions of anuria and dysuria in male cats are frequently observed by practitioners handling these small animals.

Opinions are varied concerning the etiology of these often chronic conditions. Some believe that it is due to infection, while others hold to the theory that there is an association with the age at which the cat is castrated. They reason that the older the animal at the time the operation is performed, the larger the diameter of the urethra and, therefore, a lesser incidence of anuria or dysuria.

Still others guess that a diet consisting largely of cholesterol-rich foods, such as liver, kidney, and eggs, is the chief offender. But like so many other physical complaints in veterinary medicine, all these are merely hypothetical conjectures with no actual research work ever having proved one or another.

Whatever the cause, the clinical picture is quite uniform. The patient is distinctly uncomfortable, inappetence is present, and the temperature is normal; when palpated the bladder is found to be unusually distended with urine. Digital expression of the penile meatus may reveal fine, sand-like, urinary calculi present. These are the cause of occlusion.

Catheterization at this time is contraindicated. We are dealing with a urethral epithelium which is in a subnormal condition. Probing aggravates the condition of the epithelium and defeats the purpose, which is to establish normal urinary flow through a normal urinary tract.

As soon as the patient is presented, the writer uses a 22-ga., 1½-in. needle attached to a 10 cc. syringe, and enters the bladder either through the abdominal midline or laterally. As much urine as is possible is removed by withdrawing the plunger of the syringe.

As the second step of treatment, depropanex,® which is a protein-free nitrogenous fraction obtained from an acid-alcohol treatment of mammalian pancreas, is used.

Carroll and Zingale[1] reported their experiences with depropanex extract in the relief of uretheral and renal colic. The extract produced prompt relaxation of the ureters. They further concluded that the relief is permanent and that the action is local. These authors have described the use of this agent in renal colic due to stone, stricture, kink and spasm, and dilation of organic uretheral stricture.

In a later publication, Carroll[2] and his coworkers reported that 3 cc. of pancreatic tissue extract when injected intramuscularly relieved the severe shooting pain experienced with renal colic.

Lazarus[3] treated more than 100 cases of ureteral occlusion due to calculus, spasm and stricture with pancreatic extract with good results.

Our clinical study consists of 24 cases. Of the total, 18 cats (13 castrated and five normal males) showed the usual urinary calculi. Three cases were determined to be of a non-specific urethritis, while the last three cases were nontraumatic paraplegia in dogs in which bladder paralysis was a part of the syndrome.

Treatment with depropanex brought sustained relief and a normal urination within an average eight-hour period. However, the average for the three paraplegic dogs was about 24 hours.

In four feline cases it was necessary to administer a second injection.

®Sharp & Dohme, Philadelphia, Pa.

REFERENCES

1. Carroll, G., and Zingale, F. G., *South. Med. Jour.*, 31:233 (Mar.), 1938.
2. Carroll, G., Lewis, B., and Kappel, L., *Mississippi Valley Med. Jour.*, 62:122 (July), 1940.
3. Lazarus, J. A., *Jour. Urol.*, 43:102 (Jan.), 1948.

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Terramycin Ointment: An Effective Aid in the Treatment of Bovine Mastitis

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Terramycin is one of the newer antibiotics isolated from the actinomycete *Streptomyces rimosus*. Although introduced to the medical professions only in 1950, terramycin has been granted the seal of acceptance by the Council on Pharmacy and Chemistry of the American Medical Association.

In a paper in VETERINARY MEDICINE, October 1950, Morse, Spencer and Simon[1] showed terramycin to be effective *in vitro* against numerous bacteria isolated from animals. The organisms used in their experiments included the common, mastitis-producing streptococci and *Escherichia coli*.

This report concerns the use of terramycin ointment, 30 mg./gm. in 7.1 gm. udder infusion tubes. The cases are run-of-the-mill kinds that any veterinarian would encounter in his dairy practice. They were not selected but were treated as presented until the material on hand was exhausted.

Case 1. Three quarters, flaky milk. One tube in each quarter. Milk clinically normal in 48 hours.

Case 2. Acute mastitis, one quarter. Swollen, hard, straw-colored secretion. Temperature 106 F. Cow off feed. Sulfamethazine sodium, 60 gm., administered intravenously. Two tubes terramycin in affected quarter. Cow on feed 48 hours post-treatment, temperature normal, but no visible improvement in the affected quarter. The following day secretion from the other three quarters was flaky and stringy. The contents of one tube was infused into each of the three quarters and into the swollen quarter. Within 48 hours the three quarters were normal and the swollen quarter was showing signs of softening. Treatment continued on the swollen quarter for four more days until lactation ceased.

Case 3. Two quarters, flaky milk. Quarters tense and slightly swollen. One tube in each quarter once daily for two days. One quarter normal in 48 hours, the other normal at 72 hours.

Case 4. One quarter, hard and swollen. Milk clinically normal. One tube used in an attempt to abort oncoming milk changes. Following day, milk watery and owner requested treatment with streptomycin and penicillin.

Case 5. One quarter, swollen and hard; secretion, watery and flaky. Had been treated five days with penicillin, with no results. Two tubes of terramycin daily for three days were administered. Quarter normal 48 hours after last tubes used.

Case 6. Two quarters, flaky milk. Two tubes terramycin used in each quarter. Milk clinically normal in 48 hours.

Case 7. Two quarters, hard and swollen. Milk was flaky. Treated with penicillin for three days, with no improvement. Two tubes terramycin used in each quarter daily for three days. Milk normal at end of treatment, but quarters still firm. Quarters were normal on palpation 48 hours after last treatment.

Case 8. One quarter, hard and swollen. Abnormal milk. Treated with penicillin by the farmer off and on for weeks. Milk never normal for more than four days. Two tubes terramycin were used once daily for three days. Milk clinically normal at conclusion of treatment, and quarter normal on palpation 48 hours after last treatment. Milk clinically normal for three weeks at time of this writing.

Although the cases cited are few in number, the results do indicate that terramycin ointment definitely has possibilities in treating bovine mastitis. The material has so far proved to be at least as effective as any other form of treatment now available.

In accord with the writer's recommendation, Chas. Pfizer & Co., Inc., has produced tubes containing 60 mg./gm. and further investigation is now in progress with this higher unitage tube.

REFERENCE

1. Morse, E. V., Spencer, G. R., and Simon, J., *In vitro* Sensitivity of a Number of Bacteria Isolated from Animals, to Terramycin. *Vet. Med.*, 45:405 (Oct.), 1950.

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Evidence is presented by Stewart, in *The Veterinary Record*, of significant trypanosomiasis resistance in a breed of unhumped cattle indigenous to the region and referred to as West African Shorthorns.

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The farm output per man hour is now about twice what it was 40 years ago. — *Hoard's Dairyman.*

ABSTRACTS OF LITERATURE

Diagnosis of Neoplasms

The author[29] states that the body fluids are more or less influenced and affected by the evolution of the tumor. He reviews the changes that have been observed by various authors in the blood cells, the finding of specific antigens and antibodies, modifications of the serum, and results on experimental animals. Many of the tests discussed have been abandoned as being without value, and no method has been found that is definitive as a diagnostic aid. However, the article is interesting in that the work done to find a serological or biochemical diagnostic test for cancer is extensively catalogued.

Among the procedures discussed are:

1. Changes in the red blood cells.
2. Tumor cells and red blood cells of cancer patients show, *in vitro* and under strict anerobiosis, an increased fermentation of glucose into lactic acid.
3. Reactions based on the presumed existence of specific antigens and antibodies. Since the tumor is really foreign tissue in the body, it is postulated that it could act as a foreign protein, and like an antigen, provoke the formation of specific antibodies. One group maintains that the specific antibody may be demonstrated in the patient. Others claim that the normal individual is protected from neoplasms by reason of the presence in his body fluids of a lytic principle which can destroy neoplastic tissue. When cancer appears, it is due to the disappearance of this principle and this disappearance is diagnostic. Still others postulate that the cancer patient produces no antibody, but does produce a specific protein that can act as an antigen in the experimental animal and provoke antibodies in the animal without producing disease. Deviation of complement, flocculation, surface tension changes, and cytolytic reactions are discussed.
4. Reactions based on the enzymotic properties of the serum, based on variations in the enzymes, modifications in their levels and the appearance of new enzymes in the patient with a neoplasm.
5. Reactions based on allergy have been proposed.

The article should have definite interest for those concerned with the laboratory diagnosis of neoplasms.—*M.A.S.*

[29]Drieux, H., Diagnostic Experimental du Cancer: les Methodes Biologiques. *Reueil de Med. Vet.*, 123:289 (Oct.), 1948.

Electron Microscope Study of Bovine Anaplasmosis[31]

Evaluating results of study of *Anaplasma marginale* by use of the electron microscope indicates that many of these parasites are definitely submicroscopic.

Parasites revealed under the optical microscope, when demonstrated, appear as single masses. Electron magnification shows these bodies are generally constituted of a central undivided mass of high electron density and by rounded peripheral bodies of 170 to 220 millimicrons in diameter. In some cases, the entire parasitic mass appears to be constituted of tightly packed elementary bodies. In other instances, these are dispersed throughout the erythrocyte.

These facts are suggestive of the presence of smaller units of the parasites which may explain that feature of the disease syndrome, such as infective character of the blood of recovered animals at a time when marginal bodies are at very low concentrations or cannot be ascertained definitely.

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Canine Hepatitis Virus Persists in Urine of Convalescent Dogs[30]

Infectious canine hepatitis is widespread in the United States. It is highly infectious and spreads easily.

Studies on the method of spread have revealed the facts that the disease is not airborne, nor is virus present in the saliva, blood, or feces of dogs apparently recovered from the disease. Such convalescent animals are spreaders of the contagion through the urine, which is a new concept of virus dissemination.

Virus of this disease has been recovered from the urine for as long as 161 days after inoculation of susceptible animals. Histopathological studies reveal a local interstitial nephritis and the presence of intranuclear inclusion bodies in the glomerular endothelium which indicates that the source of virus eliminated in the urine is the kidney.

[31]De Robertis, E., and Epstein, B., Electron Microscope Study of Anaplasmosis in Bovine Red Blood Cells. *Proc. Soc. Exp. Bio. & Med.*, 77:254 (June), 1951.

[30]Poppensiek, George C., and Baker, James A., Persistence of Virus in Urine as Factor in Spread of Infectious Hepatitis in Dogs. *Proc. Soc. Exp. Bio. & Med.*, 77:279 (June), 1951.

BOOK REVIEWS

Books reviewed in this department and any other books, if available, may be obtained by remitting the published price to the Book Department, Veterinary Medicine, Suite 803 Livestock Exchange Building, Kansas City 15, Missouri.

INDEX OF TREATMENT IN SMALL ANIMAL PRACTICE, by *Hamilton Kirk,* M.R.C.V.S. Ed. 2., 826 pages, 176 illustrations. The Williams & Wilkins Co., Baltimore, Md., publisher, 1951. — Price $8.00.

The fact that this book has reached a second edition since its appearance just three years ago attests its wide acceptance throughout the English speaking world.

The organization of material follows precisely that employed in the first edition though material, for the most part, has been rewritten and brought up-to-date. In the process, some considerable enlargement is apparent.

Contents are divided into three parts. The first is concerned with types of therapy. Listed are; actinotherapy, electrotherapy, chemotherapy, hormones, vaccine and serum, vitamins, barbiturates, antiseptics, anesthetics, and antihistamines. In the second, "Index" portion, diseases are discussed in an alphabetical arrangement. In these, proprietary preparations used and distributed exclusively in England are mentioned frequently enough to be confusing, if not disconcerting, to American readers. Many of these have no counterpart here. This criticism for the use of English trademarked drug preparations does not apply to all discussions. Generally, material is rich in precise, factual information. The arrangement allows for easy reference, and for these reasons the book is valuable and should prove useful to practitioners on this side of the Atlantic.

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RESTRAINT OF ANIMALS, by *John R. Leahy,* D.V.M., M.S., and *Pat Barrow,* M.S., N. Y. State Veterinary College, Cornell University. 235 pages; over 300 drawings and diagrams. Cornell Cooperative Society, Ithaca, N. Y., 1951. — Price $3.50.

Material presented in this book was prepared to supplement clinical demonstrations of restraint methods for the junior and senior classes of the New York State Veterinary College.

Basic rope and knot work precede separate discussions of methods of handling the horse, cow, pig, dog, cat, fur-bearing animals, chickens, and turkeys. There are over 300 drawings of the application of restraint apparatus or technic. These, the pen work of Mr. Pat Barrow, medical illustrator, are definitive, clear, detailed, line drawings which emphasize practical and useful methods which require a minimum of special equipment. Text material is brief, concise and explanatory, nor does it need be more; the drawings tell the story progressively.

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SURGICAL PRINCIPLES AND TECHNICS, by *W. F. Guard,* D.V.M., Chairman, Department of Veterinary Surgery, Ohio State University, Columbus. 186 pages, 97 illustrations. W. F. Guard, Columbus 12, Ohio, publisher, 1951.—Price $5.50.

The author of this work, whose reputation as a surgeon is national, has prepared what may be considered a second edition to publication in 1949 of Surgical Technics for Veterinary Students.

Actually Surgical Principles and Technics is both a revision and a supplementary text prepared for students of veterinary surgery. It should prove of value to the practitioner. New material has been added in the form of additional chapters.

A sincere attempt has been made to present the fundamental principles of surgery and wound healing. Material is practical and useful, presented in a concise, clear, and brief manner. Chapters I and II, consisting of 34 pages, are devoted to factors concerned in wound healing and presurgery; the latter divided into discussions of antiseptics and disinfectants, sterilization of instruments, asepsis, chemotherapeutic and antibiotic aids, anesthesia, shock, radiology, and postoperative care.

The remaining portions of the book are given to description of operative technics for a large number of procedures commonly performed on domestic animals. In these, the author has been mindful of the difficulties under which veterinary surgery is ordinarily performed, inexperience of assistants usually available, and limitations for performance by standard methods, with which practitioners are familiar. For this reason, the descriptions of procedures are stated simply, yet are consistent with the canons of good practical technic.

VETERINARY ITEMS OF INTEREST

Short cuts in management of poultry plants, such as the use of deep litter and old ranges, have been followed by alarming increases in the severity of parasitism on some premises.

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The Public Health Service estimates there are 7,500,000 persons in the United States who are victims of arthritis or rheumatoid disorders. Of these, 800,000 are partially and 147,000 completely disabled.

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The detection of carriers by agglutination tests is effective in the control of *Salmonella pullorum* infection in chickens, but such methods are much less effective in other Salmonella infections.

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Blackhead in chicks is reported by Dr. J. E. Witter, University of Maine. This disease ordinarily affects only turkeys, but when young chicks are exposed to massive infection, such as may be carried in old litter, development of a syndrome similar to that observed in turkey poults occurs.

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Veterinary authorities have issued repeated warnings on the use of antiparasitic drugs in the feed of poultry. The natural law of survival and development of resistance have been observed during outbreaks of coccidiosis in broilers plants, in spite of continuous medication with sulfonamides.

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Serum samples from 25 cows in a Midwest herd suffering losses of calves were tested for antibody titer against Leptospira. Symptoms of bloody urine predominated. Ten of these samples gave positive results indicating that leptospirosis may be responsible for losses of young stock in dairy herds, not heretofore attributed to this infection.

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Hypertension caused by stress conditions, anxiety and mental tension may be due to secretion by brain cells of a chemical substance causing constriction of vessels. Animal experimentation has resulted in the development of a new drug said to be antagonistic to the agent responsible for symptoms of hypertension.—*Arch. Int. Med.*, July 1951.

"Vanishing American"

The wild eyed, savage looking creature in the picture belongs to the largest surviving herd of Longhorn cattle in the world. In the Wichita mountains wildlife refuge near Cache, Okla., there are 61,000 acres of native bluestem pasture and 40 lakes. The second largest herd of buffalo in the world, along with many elk, deer, antelope, wild turkey, etc., seem to be of secondary interest to the hundreds of thousands of people who attend the world's largest Easter pageant which is presented on the grounds of the refuge, and, to the thousands of people who find the refuge a year around playground for hunting and fishing.
When the Longhorn herd was founded in 1927, great care was taken to preserve the natural color and lines of the original breed, which was a blend of original Spanish cattle and some mongrel American stock, developed on Texas pastures. The result was a large, tough, bony, multicolored critter. He was wild and savage as the environment from which he came. He could fight like a tiger and run like a deer. His history is so packed with drama in the rugged days of pioneering that he will always remain an object of admiration and interest.

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A New Preparation for the Treatment of Canine Dermatoses

(*Continued from page* 363)

shows it to be effective against fleas and lice, as well as against mange mites and fungi.

3. Reports from field use by owners to whom the agent was dispensed indicate promise as an excellent tick repellent.

4. Studies by an eminent, independent toxicologist indicate that the compound is absolutely non-toxic when used in the recommended dilution. It may be applied to the entire body surface one or more times daily without ill effect.